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VOLUME NO. 2
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# EXPLANATORY NOTES

OF

INCREASES, DECREASES, AND CHANGES IN LANGUAGE

IN THE BUDGET FOR THE

DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDING JUNE 30, 1932

AND OF

WORK DONE UNDER EACH OF THE APPROPRIATION ITEMS

CONFIDENTIAL UNTIL THE 1932 BUDGET
IS SUBMITTED TO CONGRESS)

(SEE VOLUME 1 FOR INDEX
AND FINANCIAL STATEMENT)

# FOREST SERVICE

## (a) GENERAL ADMINISTRATIVE EXPENSES

| | |
|---|---|
| Appropriation, 1931 ..... | $362,230 |
| Brookhart Act adjustments ..... | 3,570 |
| Total, 1931 | 365,800 |
| Budget, 1932 ..... | 370,640 |
| Increase | 4,840 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| General Administration | $362,030 | $365,800 | $370,640 | $ 4,840 |

(1) $4,840 for an expert in the Washington Office in forest fire control on the National Forests. Intensive study of financial and protection problems of the National Forests by leaders of the Forest Service has disclosed the fact that certain responsibilities which can be met only by the Washington office are not now being met and can not be met without additional personnel. The Washington office must inspect Regional fire control activities sufficiently to keep in touch with what is being done; studies must be made and detailed information gathered to enable the Chief Forester and his staff assistants to give effective leadership and control to fire control activities; information must be disseminated and new or better methods "sold" to all Regional organizations as such methods are evolved by experience; new methods or new types of equipment developed for use in one Region must be studied for possible application under different conditions elsewhere on the widely scattered National Forests; numerous national trade, manufacturing, and business associations must be cooperated with in order that such National associations will function most effectively, each through its own channels in preventing forest fires and in introducing safety measures and devices which will reduce the occurrence of forest fires.

Systematic forest fire control as required by American conditions has never been developed in any other country. It is less than 30 years old in America. It is not yet fully effective and as in any other new industry or business of similar complexity, the most efficient and economical practice must be developed out of experience and current successes and failures. The office of the Chief Forester must take a more active part in this development if effective protection is to be attained at the earliest practicable date.

### ACTIVITIES UNDER THIS APPROPRIATION

This appropriation provides salaries and expenses of employees in the Washington office engaged on general administrative and service-wide sub-technical activities pertaining to the National Forests and other general service activities.

## (b) PROTECTION AND ADMINISTRATION, NATIONAL FORESTS

Explanation of change in language: The change of the word "district" to "region" in each of the nine paragraphs which show the appropriations for the National Forest Regions is recommended in order to eliminate the long standing administrative confusion in the use of the term "district" in connection with the two administrative divisions "National Forest District" and "Ranger District".

The omission of "Illinois" from the language of the paragraph which shows the appropriation of Salaries and General Expenses for National Forest Region 7 is recommended since there is no National Forest area in Illinois at the present time, the Savanna area having been released to the War Department.

| | |
|---|---|
| Appropriation, 1931..... | $6,985,000 |
| Transfer from Equipment and Supplies Appropriation..... | 123,600* |
| Brookhart Act adjustments ..... | 44,480 |
| Total, 1931 ..... | $7,153,080 |
| Budget, 1932,..... | 7,295,240 |
| Increase | 142,160 |

*Transfer to this appropriation proposed in Budget, 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Fire Prevention | $2,006,800 | $2,092,750 | $2,134,910 | $ 42,160 |
| Fire Suppression | 242,700 | 248,798 | 248,798 | -- |
| Construction of Improvements | 685,000 | 702,435 | 702,435 | -- |
| Maintenance of Improvements | 596,500 | 611,362 | 611,362 | -- |
| Commercial timber sales | 1,002,400 | 1,049,550 | 1,073,550 | 24,000 |
| Timber Sales at Cost, | 54,925 | 56,272 | 56,272 | -- |
| Development of Forestry Practice | 53,925 | 55,255 | 55,255 | -- |
| Timber Survey | 199,700 | 204,890 | 204,890 | -- |
| Planting | 58,925 | 60,444 | 60,444 | -- |
| Free use of timber | 14,075 | 14,350 | 14,350 | -- |
| Tree diseases and insects | 127,800 | 182,304 | 202,304 | 20,000 |
| Administrative investigations | 73,800 | 75,810 | 75,810 | -- |
| Grazing administration | 971,500 | 999,770 | 1,009,770 | 10,000 |
| Range reconnaissance | 73,900 | 75,710 | 75,710 | -- |
| Fish and Game | 112,850 | 115,700 | 121,700 | 6,000 |
| Land adjustments | 66,900 | 68,590 | 68,590 | -- |
| Land exchange and acquisition | 85,900 | 88,020 | 88,020 | -- |
| Special Uses | 177,750 | 182,300 | 186,300 | 4,000 |
| General surveys and maps | 161,750 | 165,870 | 173,870 | 8,000 |
| Control recreational areas | 64,900 | 66,550 | 74,550 | 8,000 |
| Administration new units | -- | 20,350 | 40,350 | 20,000 |
| Alaska Boat | 16,000 | 16,000 | 16,000 | -- |
| Total | $6,848,000 | $7,153,080 | $7,295,240 | $142,160 |

The increase of $142,160 is submitted for the following purposes:

(1) Increase of $42,160 for Fire Prevention: Despite the betterments of recent years in organization, training, personnel management, financial management, and all the technique on which fire protection depends, the losses on the National Forests remain wholly incompatible with the redemption of the Federal Government's responsibility for the protection of these vast public properties. Average annual losses of gross area within the National Forests by five-year periods are as follows:

| | |
|---|---|
| 1910 to 1914, inclusive | .75% |
| 1915 to 1919, inclusive | .60% |
| 1920 to 1924, inclusive | .27% |
| 1925 to 1929, inclusive | .326% |

Each of these five-year periods includes one or more of the extreme seasons in which the bulk of the fire losses occur. The record expressed in this way averages good seasons with bad for each five-year period and it is a fair measure of what has been accomplished. There has been a steady record of progress until the last five-year period. The curve of progress has now been reversed and losses are going up.

It is impossible to convey by figures the nature and extent of these losses from fire. Those who have seen some of the regions affected know what these losses mean in terms of merchantable timber converted into worthless skeletons of trees, young tree growth destroyed, and watersheds ruined. The area of idle land on the National Forests is increasing for lack of a protection effort adequate to meet the danger resulting from an accumulative shortage of precipitation in recent years and the rapidly increasing industrial and other uses of the National Forests.

The nature of the costly and destructive season of 1929 was recognized well in advance. Responsible officers went as far as practicable under the existing financial limitations to strengthen their organizations in order to cope with the situation; but the utmost they could do was inadequate.

The number of guards required by the nature of the season could not be employed and distributed over the Forests so as to catch fires while small, which is the only time at which they can be handled cheaply and satisfactorily. Funds were lacking to purchase the number of pack animals and trucks required for prompt transportation of fire fighters. Water using equipment in the form of tanks mounted on heavy trucks or portable power pumps with hose had not been provided in anything like an adequate number. The supply of hand tools, mess outfits and numerous articles of equipment gave out at many places.

The result was an extreme expenditure for fighting large fires and vast areas burned which had been successfully protected during previous years. Nothing is gained by a scale of expenditure which is adequate for easy or average fire years which experience has shown are bound to occur intermittently.

To meet the fire problems on the National Forests requires a balanced program which includes development of the technique of protection, construction of additional improvements, increased effort to prevent carelessness and the starting of man-caused fires, the employment of additional fire guards and the purchase of larger quantities of protection equipment.

It is estimated that expenditures chargeable to this activity in the fiscal year 1931 will be $2,092,750. While definite allotments are made for the employment of temporary men engaged on this activity, it is not possible to make such allotments for the salaries and expenses of men in charge of physical units. Fire conditions vary from year to year and there is, therefore, a corresponding variation in the amount of time spent on the fire prevention activity. The figure given above is an estimate for a normal season.

The increase if received, will be expended as follows; $12,000 in Region 1; $15,500 in Region 5; $10,000 in Region 6; $2,500 in Region 7; $2,160 in Region 9.

<u>(2) $24,000 for Commercial Timber Sales:</u> For the fiscal year 1930, timber sale receipts were $4,388,600, or $280,000 greater than for the fiscal year 1929. This is an increase of about 7 per cent. As is indicated by the following table, the timber sale business of the National Forests has been increasing at an average rate of about 10 per cent annually, although the in-

crease is irregular by years, depending on general conditions in the lumber industry and the time when cutting begins on large, long-term sales.

| Year | Receipts | Increase or Decrease | Per Cent of Increase | Per Cent of Increase In Appropriation |
|---|---|---|---|---|
| 1922 | $1,813,200 | | | |
| 1923 | 2,721,900 | $ 908,700 | + 50.0 | 3.1 |
| 1924 | 3,036,400 | 314,500 | + 11.7 | - |
| 1925 | 2,940,400 | - 96,000 | - 3.2 | 10.6 |
| 1926 | 3,366,700 | 426,300 | + 14.2 | 3.5 |
| 1927 | 3,253,300 | - 113,400 | - 3.1 | - |
| 1928 | 3,325,100 | 71,800 | + 2.2 | 5.3 |
| 1929 | 4,108,600 | 783,500 | + 23.6 | 2.9 |
| 1930 | 4,388,600 | 280,000 | + 6.8 | - |
| Increase in 1930 over 1922 | | 2,761,800 | + 143.0 | 27.9 |

Each increase in business involves more work of marking and scaling timber and of contract enforcement, and consequently additional costs which are returned many fold by the increases in receipts. Since 1922, receipts have increased a total of 143 per cent and appropriation increases for sale administration have amounted to only 27.9 per cent. It has been possible to handle the increased business only by postponing other urgently needed work, but in some cases the making of desirable sales has had to be deferred because funds for the administration of those additional sales were not available. A number of large sales have been made during the past year in the belief that increased funds for their proper administration will be made available, as an inescapable accompaniment of a growing business.

It is estimated that expenditures chargeable to this activity in the fiscal year 1931 will be $1,049,550. A large proportion of this charge represents the time of men in charge of physical units who work on a large number of activities, including such activities as fire prevention and fire suppression. The actual amount charged to the commercial timber sales activity may, therefore, vary considerably from the above estimate.

The increase will be spent in Colorado, Washington and California. In the two former states recent large new sales will begin operations in 1932 requiring additional personnel. In California the timber sales organization has not been sufficiently manned for some time and it has been necessary to curtail other lines of work in order to give timber cutting proper administration.

(3) $20,000 for tree diseases and insects. The entire amount will be used for control of white pine blister rust.

Very little work is now being done to combat dangerous tree diseases, due to lack of funds. The presence of the white pine blister rust within the National Forests of North Idaho, however, makes necessary the protection of the valuable white pine on the National Forests lands in this region or the abandonment of any attempt to grow this species, which is by far the most valuable component of the stand. Protection can be given by destroying the wild currant and gooseberry bushes on which the disease is dependent during part of its life cycle. Practicable methods of destroying these alternate hosts have been developed and demonstrated by the Bureau of Plant Industry.

A program for eradicating these bushes from approximately 1,500,000 acres of National Forest land in North Idaho and immediately adjacent portions of Montana and Washington has been carefully worked out in accordance with the advice of the Bureau of Plant Industry. An allotment of $25,000 will be available for the fiscal year 1931. This however, does not permit of organizing the work on anything like a comprehensive basis, considering the seriousness of the situation and the size of the job. Work under this program should begin at once on a commensurate scale, since every year will see the further spread of the disease and the hopeless infection of more areas of the valuable white pine. Further investigations and experiments by the Bureau of Plant Industry may produce cheaper methods of doing the work, and full advantage of any opportunities to reduce costs will be taken. The alternative to starting the work promptly is to abandon all attempts to grow white pine on these areas, which will mean the production of inferior species which, at the present time, are worth logging only under very exceptional conditions of accessibility, and will probably always be worth much less than whit pine per unit of volume. The lumbering industry of the region is now based largely on the production of pine lumber and could not continue without this valuable wood. Further delay would mean the loss of valuable National Forest property, which should be and can be protected, and heavy future loss to the industries and communities of the region.

(4) $10,000 for Grazing administration.

(a) $1,000 for removal of wild horses. It is estimated that 18,000 wild horses trespassed on the National Forests last year, and that approximately $20,000 per year would be received in increased grazing fees if gentle domestic livestock could take the place of the trespassing animals. The clearing of the range of this nuisance is absolutely necessary to proper grazing administration. Without this increase steps can not be taken which are necessary for reasonably good management and utilization of National Forest ranges. Increased grazing fees now required of livestock owners strengthen the Government's obligation to eliminate, in so far as practicable the handicaps to good range management.

The increase, if received, will be expended as follows: Region 2, $350; Region 3, $350; Region 4, $300.

(b) $9,000 for Technical men. On most of the National Forests grazing is a very important activity and its proper regulation has a vital bearing upon the maintenance of vegetative cover, which in turn is essential to the preservation of the soil itself. Men with special training in plant growth requirements, plant food values, proper methods of handling stock, etc. are particularly needed in order to analyze range problems and to develop plans for handling the range and livestock so as to maintain the livestock industry on the forests as fully as possible without injury to the forage, soil, timber growth, and related resources.

The rank and file of forest officers do not have special training in the technical phases of range and livestock management. It is necessary to depend upon the few men who enter the Service through the technical grazing examination to conduct the research necessary to form the basis of best management practices and to apply the results of research throughout the National Forests. Most of the men of this class who have been inducted into the administrative organization of the National Forests have so many general administrative responsibilities that it is impossible for them to devote particular attention to technical grazing work except what is incidental to their general activities. Only about thirty-five have their time largely available for range management work. It is urgent that a

limited number of positions be added so as to make available additional trained men for this activity. They would be assigned to individual forests in the West where the grazing problems are most acute in the following Regions: Region 2, $2,250; Region 3, $2,250; Region 4, $2,250; Region 6, $2,250.

(5) $6,000 for Fish and game. Wild animals and fish are important resources of the National Forests. Their management involves an important question of land use and requires the highest degree of specialized or technical knowledge that it is possible to secure. The more or less practical phases of fish and game administration can be taken care of by the present field organization, but if greater attention is to be given to the scientific phases of these resources it will undoubtedly be necessary to increase the time of local foresters.

To supplement information on fish and game conditions in the National Forests the time is fast approaching when more specific and definite knowledge of these resources is urgent. There is need for careful studies in cases where the situations have become acute. There are now a number of forests on which the problem is so important that the assignment of specially qualified men working out the solution seems practical and promises much better results than could be obtained through the ordinary method of handling the situations with existing organizations. As the need arises for close study of the forage resources by special grazing men, so the need arises for a close study of game animals and fish by the biologist and fish culturist. It will require the services of specially trained men. Not only must they have the technical knowledge but they must obtain training in the administrative problems involved and be able to correlate administrative and biological requirements. There is immediate need for the assignment of such men to study the technical and practical problems of fish culture in the streams and lakes of central Idaho and Western Wyoming. Here the local sentiment is strongly in favor of such a study. The same need and sentiment prevail generally in the mountain regions occupied by the National Forests, but if trained men were available they would be sent immediately to the central Rocky Mountain region, and the expenditures would be approximately as follows: Region 3, $2,000; Region 4, $4,000.

(6) $4,000 for administration of special uses of National Forests:

The National Forests are adapted to and in growing demand for a wide variety of commercial and industrial uses. There are now in effect 34,197 special-use permits, of which 15,956 are free and 18,241 are on a pay basis. The receipts therefrom for the fiscal year 1930 amounted to $300,370. The average increase during the past seven years has been $13,269.00 per year. Substantially larger revenues would be derived if funds were available to conduct the surveys and develop the plans through which additional lands could be made available for occupancy. The newer demands involve much larger investments, more expensive structures and more permanent occupancy, hence can not be authorized without careful prior planning, study, surveys, etc., to secure proper coordination and avoid conflict with other National Forest requirements. More careful and frequent supervision also is required. This imposes a growing drain upon the available time of the field organization, for which other arrangements must be made.

The California region estimates that if $2,500 were made available for survey of summer-home lots, an additional annual revenue of $10,000 would result. In the Northwestern Region an expenditure of $4,000 would yield an annual increase of $5,250; in the Lake States Region an expenditure of $680 would result in an annual increase of $1,800. Similar expenditures in other regions would also result in increased receipts.

The plan of the Department will be to so augment and arrange the field administrative organizations of the National Forests as to permit of the execution of the surveys and plans and degree of supervision requisite to the proper conduct of this form of utilization of the National Forests.

(7) $8,000 for General Surveys and Maps. This amount will be used for general surveying and drafting work for activities and projects necessary for the administration, protection and development of the National Forests. It is not intended that any portion of this amount shall be utilized in the making of the standard topographic maps of National Forest areas since it is understood that the estimates of the Secretary of the Interior will include an amount to cover the needs for such mapping.

A very decided need exists for an increase in the amount of money for mapping and drafting work done directly by the Forest Service. This is not a duplication of work done by the Geological Survey or the General Land Office but is confined to project work required for Forest activities. Greater use of the Forests, more demand for Forest products, decided intensification in administration, protection, methods and requirements make necessary far more maps, more accurate maps and maps on larger scales. The recommended increase of $8,000 would be used in the Forest regions for miscellaneous mapping and drafting work such as boundary surveys and boundary posting, map correction and revisions, assembling and recording data on land status, retracement of land office surveys and copying field notes where such work is not done by the Land Office itself, drainage surveys, topographic surveys of areas smaller than would be mapped by the Geological Survey or on a larger scale, third and fourth order control for project surveys, locating lookout stations, making visibility maps, making triangulation ties between surveys of General Land Office and Geological Survey and similar work require specifically and primarily for Forest Service activities and to meet its needs.

(8) $8,000 for supervision of recreational uses:

(a) Because of their nature, extent and distribution the National Forests provide infinite possibilities for public use for purposes of outdoor recreation. Since 1917, the number of people visiting the National Forests has increased from less than 4,000,000 to almost 32,000,000. As a by-product of their administration the National Forests are peculiarly capable of rendering this service without interference with their major purposes and their use for recreation is socially and economically desirable and necessary. Many National Forest areas are of out-standing value for recreational use and private capital is making heavy investments in their development under permit.

(b) The plan of the Department will be: To so coordinate, supervise and control the recreational use with other uses and purposes of the National Forests as to permit the full realization of its potential public values compati-

ble with other National Forest purposes and services and to minimize its adverse influences upon public property and health. Generally, this will be accomplished through the part-time attention of the men in charge of the physical units of management, but in cases where public use is extensive and intensive specialized study and planning of conditions of use and development, and supervision thereof will be necessary.

(c) Cooperation: No cooperation by other Federal agencies is at present forseen, but the cooperation of State and private agencies in a wide variety of services, facilities and contributions of work and materials is secured and anticipated.

(d) Present Work: Department now supervises use of National Forests by almost 32,000,000 persons. Work consists of guarding against risks to public health and property; enforcement of State sanitary ordinances, issuance of camp-fire permits, exclusion of people from closed areas, coordination of recreational use with other uses, protection and maintenance of public campgrounds, general direction and supervision of public use. Almost all this work must, under present conditions, be incidental to the regular duties of rangers and guards, and the part of their salaries and expenses chargeable to this work is estimated for the fiscal year 1931 to be in the neighborhood of $65,000. As this use grows increased provision for its supervision and control must be made. State and other agencies engaged in maintaining similar activities have, as a rule, found it necessary to maintain continuous supervision during the period of heaviest use.

(9) $20,000 for administration of new Units: The purchase of land is steadily going forward under the Weeks Act as amended by the Clarke-McNary Act but the purposes of these acts are frustrated and the expected public benefits will not follow unless the areas are placed under administration and protection as purchased. Purchase of such lands is the first step in a program of watershed protection and rational management of such areas but it is only the first step. Purchase should be followed by the employment of Forest Supervisors, Rangers, clerks, and fire guards and the purchase of working equipment. If this is not done the land remains unprotected and the investment of Federal funds in such land suffers an unbusiness like neglect.

Where a National Forest has already been established, improvements constructed and necessary personnel employed, the purchase of land usually does not require additional appropriations for protection and administration but this is not true when new units are established. Unless additional funds are appropriated for entirely new units they must go uncared for or the protection and administration of existing units must be weakened to supply a makeshift organization for the new units. During the fiscal year 1931 such makeshift arrangements must be resorted to on a number of new Ranger districts and National Forests.

If the increase is received approximately $16,000 will be expended in Region 7 and $4,000 in Region 9.

## ACTIVITIES UNDER APPROPRIATION FOR PROTECTION AND ADMINISTRATION OF NATIONAL FORESTS

This appropriation is used for the general operating expenses of the National Forests and National Forest Regional Offices, including the following items:

1. Salaries and travel expenses of the men in charge of the various units of organization such as National Forest Regions, National Forests, and Ranger Districts. There are now nine National Forest Regions, 146 National Forests and 758 Ranger districts. These men direct the administrative, protective and improvement activities carried on in the units for which they individually are responsible and during the course of a year will devote varying portions of their time to practically all of the projects listed. For some of the projects worked on and supervised there are special appropriations, but the salaries and, except under certain special conditions, the travel expenses of the men in charge of administrative units are paid entirely from this appropriation. It would be impossible to exert financial control over the many general and special appropriations if an attempt were made to pay the salaries and expenses of men in charge of physical units from special appropriations in proportion to the varying amounts of time spent on the different projects. This method of financial management accounts for a large part of the charges from this appropriation to projects for which there are special appropriations.

2. Salaries and expenses of the assistants to these supervisory officers including the salaries of clerical employees. Exceptions are that when such an assistant or clerk is wholly employed on an activity such as tree planting or road construction, for which a special appropriation is available, his salary and any necessary travel expenses are paid from the special appropriation; also when the time of an assistant is divided between work for which there is no special appropriation and work for which there is a special appropriation in a way which calls for adjustment as a matter of law and fairness between appropriations, the cost of his time and travel expense, if any, is so divided. Such adjustments are controlled by instructions which are based on the related Acts of Congress, and policies and purposes of Congress and the Bureau of the Budget and the Secretary of Agriculture.

3. Salaries of fire guards, scalers and other short-term employees engaged on work for which there is no special appropriation. Twenty-eight hundred fire guards are employed as required by the fire danger in each locality. Periods of employment vary from one to six months and average about three months.

When such work as building or fence construction is needed at the station of a fire guard he is employed on such work if arrangements can be made so that he can be called by telephone when a fire is discovered. Also, if periods of wet weather occur during the fire season, fire guards are used so far as possible on any other work needed, such as improvement work of all kinds. In both of such instances the guard is paid from the special appropriation if funds are available. If the special appropriation concerned is exhausted the guard is nevertheless used on the special work as a matter of good business management, but his wages are paid from the Protection and Administration appropriation which is used while the man is required for straight fire duty.

4. Fire Protection equipment is purchased from this appropriation to the extent that funds can be made available therefrom.

5. Miscellaneous costs of operation such as rent of offices, telephone and telegraph tolls, freight, express, supplies and equipment not provided by special appropriations.

The actitivies provided for wholly out of this appropriation include the following:

Fire prevention
Commercial timber sales
Timber sales at cost
Development of forestry practice
Free use of timber
Tree diseases and insects
Grazing administration
Fish and Game
Special uses
General surveys and maps
Control of recreational areas.

The activities listed in the project statement for this appropriation for which there are also special appropriations, are given below:

Fire suppression
Construction of improvements
Maintenance of improvements
Timber surveys
Planting
Administrative investigations
Range reconnaissance
Land adjustments
Land exchange and acquisition

(c) FIGHTING FOREST FIRES

| | |
|---|---|
| Appropriation, 1931 . . . . . | $100,000 |
| Budget 1932 . . . . . | 100,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Fire Suppression | $3,167,000 | $67,000 | $67,000 |
| Protection of Lands, Railroad Forfeiture Suits | 33,000 | 33,000 | 33,000 |
| Total | $3,200,000 | $100,000 | $100,000 |

Activities Under Appropriation, Fighting Forest Fires

This appropriation is used primarily for the suppression of forest fires, with the exception of the amount required to give the lands known as the Coos Bay Wagon Road and Oregon and California railroad lands the same protection from fire which is given adjacent National Forest or privately owned lands protected by associations of private owners. Otherwise administrative restrictions placed upon the use of the appropriation by the Forest Service provide that expenditures shall not be made from it until forest fires have actually started. An exception is made to this rule, however, when fire conditions become so critical that the regular protective organization, which is financed from "Protection and Administration, National Forests", is unable to cope with the situation and when, therefore, the temporary employment of additional guards will reduce expenditures for fire fighting. Expenditures are made for the employment of fire fighters and their transportation, equipment needed on going fires when not available in stocks of equipment previously purchased from the Protection and Administration appropriation or in connection with fires of previous years. The appropriation is used for travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Service when the travel performed extends beyond the boundaries of the units to which they are regularly assigned or when the activities to which men are assigned do not include fire fighting.

The amount given in the appropriation act is nominal because it is impossible to predict in advance what the expenditures for such an uncertain activity may be. Supplemental estimates are submitted each year to cover expenditures in excess of the amount appropriated in the regular appropriation act.

## (d) AERIAL FIRE CONTROL

| | |
|---|---|
| Appropriation, 1931 . . . . . | $50,000 |
| Budget, 1932 . . . . . | 50,000 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Aerial detection and reconnaissance of forest fires | $49,000 | $50,000 | $50,000 |

### Activities Under this Appropriation

This appropriation is used to operate aircraft in California, Oregon, Washington, Idaho, Montana, Michigan, Minnesota, and Arkansas in forest fire protection work. Beginning with the fiscal year 1929 this activity was carried on by contracting with commercial flyers instead of in cooperation with the War Department. The Forest Service has used aircraft in protection work for eleven seasons. It was at first believed air patrol would afford quicker detection of fires than could be secured by lookout men on towers and mountain peaks. Experience has disproved this as a general proposition. Nor is it surprising that relatively few reports of fires have come from the aircraft, since any one locality is under observation only a short time during the twenty-four hours even if two or three patrols are made daily. Continuous observation of the terrain, such as lookout men on towers and mountain peaks have if intervening topography does not cut off a great part of their view, is essential to effective fire control.

The use of airplanes after lightning storms to search out smoldering fires which might be hidden from ground lookouts by intervening ridges has as yet given disappointing results but the possibilities of this use of aircraft have not been exhausted. During the season of 1929 a fire on the Superior National Forest escaped and assumed large proportions. A seaplane was necessarily used to reconnoiter this fire and in the course of such reconnaissance flight several new lightning fires were discovered which were hidden from the lookout men on towers by the smoke of the large fire. In this unusual situation on the Superior National Forest the seaplanes used were of incalculable aid in reconnoitering the large fire, in rapid transportation of men and equipment from lake to lake and in the discovery of new fires which otherwise might have assumed considerable size before detection on account of the smoke blanket.

(e) LANDS

| | |
|---|---|
| Appropriation, 1931 ..... | $52,500 |
| Brookhart Act adjustments..... | 200 |
| Total, 1931..... | 52,700 |
| Budget, 1932..... | 58,980 |
| Increase | $ 6,280 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Classification of national forest lands, location, survey and appraisal of lands to be acquired by exchange and entry survey of forest homesteads, | $51,900 | $52,700 | $58,980 | $6,280 |

The increase of $6,280 is needed for expediting the execution of the provisions of forty-three acts of Congress which authorize the acquisition of private lands within or adjacent to the exterior boundaries of National Forests, through exchange of National Forest timber or land for private land.

(a) This appropriation relates also to land classification and entry surveys, but these activities are now of negligible extent, and hereafter will require only nominal expenditures. But within the National Forests there are almost 24,000,000 acres of State and private land of which approximately one-half should ultimately be acquired through exchange or donation, while adjacent to the Forest boundaries and integrally related thereto there are probably 5,000,000 acres more that should be under joint administration. Therefore, the total exchange program is approximately 17,000,000 acres. In addition to the general exchange act of March 20, 1922, Congress has passed many other acts extending exchange authority to lands within prescribed distances of Forest boundaries. Recognition by States, counties, railroads, lumber companies, etc., that the present trend in land economics militates against permanent private forest management of much forest land now privately owned is now leading to many requests that lands for which no other adequate protection is assured be placed under National Forest management through exchange.

(b) The plan of the Department will be:

To receive and consider applications for land exchanges under appropriate acts where they apparently are in the public interest, to examine and appraise both the offered and selected lands or selected stumpage, and to consummate such exchanges

to the full extent compatible with the best public interest. To safeguard local equities, the amount of National Forest stumpage used for exchanges is not allowed to exceed ten per cent of the timber-sale receipts in the same State in the same year.

(c) Present Work:

Since the inception of this work 535 separate exchanges have been consummated through which the United States secured title to 780,452 acres of land valued at $3,313,983 for which it granted 236,146 acres valued at $1,289,088 and 587,587,000 board feet of stumpage valued at $1,664,515. During the calendar year 1929, consummated cases numbered 141, offered lands 240,732 acres valued at $963,217; selected lands 50,156 acres valued at $227,381 and selected stumpage valued at $643,837. At present much of this work is accomplished by contributions of time of men assigned to other activities, but this condition cannot permanently be continued and the activity should be adequately financed by direct appropriation.

## (f) SANITATION AND FIRE PREVENTION

Explanation of change in language; The insertion of the words "and maintenance" is recommended in order that there may be no question of authority to use the appropriation for maintenance of constructed improvements.

| | |
|---|---|
| Appropriation, 1931 | $57,000 |
| Budget, 1932 | 67,000 |
| Increase | $10,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Construction and maintenance of sanitary facilities and for fire prevention on public camp grounds, | $49,400 | $57,000 | $67,000 | $10,000 |

The increase of $10,000 is needed for the construction of sanitary and fire prevention facilities on public campgrounds.

(a) During calendar year 1929, the number of people who used the National Forests for recreational purposes was estimated to be 31,758,231, e.g. Special Use Permittees and Guests, 376,780; Hotel and Resort Guests, 1,795,861; Campers, 1,902,961; Picnickers, 3,066,456; and Transient Motorists, 24,626,173. This represents an increase of 38 per cent over the preceding

year, and of 905 per cent over the year 1917, when the first detailed estimates of recreational use were compiled. This enormous use of National Forests is not only of outstanding social importance and advantage but it is also the basis of an extensive commercial development, creating markets for services and supplies, which are of nation-wide significance.

It does, however, create hazards to public property and health. Such hazards can effectively be minimized or eliminated by provision of adequate campgrounds affording simple facilities for the control of fire and for good sanitation. The chief purpose of the campgrounds is a protective one; the concentration of risks upon areas where they can be controlled or guarded against. The protective value of campgrounds has repeatedly been demonstrated in the experience of not only the Forest Service but of other protective agencies. To provide these people adequate camping facilities, which will minimize hazards to public health and fire risks, over 1,500 areas have been recognized and designated as public campgrounds. Upon 1,492 of these campgrounds some facilities have been established, principally toilets, garbage pits, sources of water supply, fire places, etc. Public interest demands a more rapid rate of progress in the equipment of these campgrounds. While primarily important as safeguards to public health and property they also secure greater realization of the public services and values of the National Forests and stimulate the commercial development of the regions of which they are parts.

(b) The Plan of the Department will be:

To clear or otherwise prepare areas required as public campgrounds, and to install thereon simple water, sanitary and fire control facilities with a view (a) of concentrating campers upon areas of low sanitary and fire hazard, (b) preventing the occurrence of unsanitary conditions and (c) minimizing risk of fire damage to National Forest timber.

(c) Cooperation:

No Federal Cooperation. To date 17% of cost of work has been contributed in labor, materials and supplies by State or private cooperators.

(d) Present Work:

As outlined in (b). Appropriation is propated between the nine National Forest Regions in the same proportion as the estimated cost of the Regional program bears to total cost. Appropriation expended exclusively for materials and labor, no part being used for salaries or overhead.

(g) EQUIPMENT AND SUPPLIES

| | |
|---|---|
| Appropriation, 1931..... | $130,000 |
| Brookhart adjustments..... | 300 |
| Total, 1931..... | 130,300 |
| Budget, 1932..... | 0 |
| Transfer to other appropriations, 1932..... | 130,300* |

*In order to clarify the appropriation set up, transfer of this amount to the following appropriations is proposed in Budget, 1932: Protection and Administration, National Forests, $123,900 (includes $300 Brookhart adjustments); Research in Forest Management, $4,000; Range Investigations, $400; Forest Products, $2,000.

(h) PLANTING NATIONAL FORESTS

Explanation of change in language: The passage of the Act of June 9, 1930 (Public No. 319, 71st Congress), makes it desirable to change the language of the appropriation for planting on National Forests in the Appropriation Act for the fiscal year 1932. Sections 1 and 2 of that Act constitute basic legislation with reference to National Forest planting, and cover the field completely except for "experiments and investigations" which are authorized by the wording of the appropriation in the regular Appropriation Act for 1931 and for many previous years. It is desirable to retain the authorization for experiments and investigations in order to avoid any possibility of lack of authority for administrative officers to conduct experimental work as an incident to their regular work.

| | |
|---|---|
| Appropriation, 1931..... | $225,000 |
| Budget, 1932..... | 250,000 |
| Increase..... | $ 25,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Reforestation by planting of national forest areas and investigations of planting and nursery problems | $209,000 | $225,000 | $250,000 | $25,000 |

The increase of $25,000 is for reforestation by planting of National Forest areas and Investigations of planting and nursery problems: To enlarge the planting program on the National Forests as authorized by the Act of June 9, 1930 (Public No. 319, 71st Congress). There are 2,200,000 acres of National Forest land which should be growing good timber crops but are not doing so. Past fires are the chief cause of this condition. The eastern National Forests, however, contain some open areas of abandoned fields and pastures which should be planted and which are included in the above figure. The present appropriation of $225,000 is sufficient for a planting program of between 20,000 and 25,000 acres annually, so that it would require over 100 years to finish the job now on hand. In addition, the program of the National Forests

Reservation Commission for land purchases east of the Great Plains in constantly adding areas of accessible, open or burned land which must be planted in order to be productive of wood crops.

The requested increase of $25,000 is chiefly to start planting or to enlarge the scale of existing projects to be more nearly commensurate with the needs on eastern forests. It will enable the planting of 3,000 to 5,000 acres annually on these Forests after the necessary nursery establishments and enlargements and other preliminary work has been completed. The most urgent need is on the National Forests in the Lake States, especially in Wisconsin and Michigan. Additional nurseries are needed in both States to furnish small trees for planting promptly those portions of the areas acquired by the National Forest Reservation Commission which, in the past, have been burned so hard that planting is necessary to restore the forests as crops. Similarly, the planting of open and burned National Forest lands in Pennsylvania, West Virginia and other Appalachian and Eastern States is now on an inadequate basis, if the United States is to accomplish the purposes for which these lands have been acquired. No increases in the scale of planting operations on National Forests east of the Great Plains is possible except as increased appropriations are made. The present appropriation is used chiefly to carry on projects on the Western Forests, of such large size that it will take centuries to complete them. Most of them are now stabilized on the bases possible under the existing appropriation, and no great expansion in any of them is planned for out of the increase estimated for Fiscal Year 1932.

## Activities Under this Appropriation

Planting on the National Forests is resorted to only where it is not possible to obtain regeneration naturally. In sales of National Forest timber provision is made for natural regeneration through the reservation of seed trees. Where fires have repeatedly burned over areas there is nothing left to furnish seed and as a result such areas grow up to a tangle of weeds, brush and light seeded tree species of low commercial value. Unless such areas are planted they will remain in this non-productive condition for a long period of years.

There is much to be accomplished before the young plants can be furnished for the restocking of such devastated areas. Nursery sites must be provided, improvements including dwellings, storage sheds, extracting plants, water systems and cultivation machinery must be purchased and constructed, cones must be collected and the seeds extracted and cleaned, and last the seed must be planted and the plants tended up to the time they are ready to be transplanted to the field. Care must be given the planting of each individual tree if it is to withstand the first three or four years battle to survive. Once established the trees grow rapidly and it is a reasonably good risk that they will reach maturity. From 800 to 1200 trees are planted per acre so the job of furnishing planting stock for an annual program of 25,000 acres is no small undertaking and requires constant careful planning years in advance of each year's output. Through experience the technique of both nursery practice and field planting has improved and is resulting in lower total costs for reforestation.

(i) RECONNAISSANCE

| | |
|---|---|
| Appropriation, 1931 ..... | $121,000 |
| Brookhart Act adjustments..... | 320 |
| Total, 1931..... | 121,320 |
| Budget, 1932..... | 131,260 |
| Increase ..... | $ 9,940 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Timber Survey | $67,050 | $74,800 | $79,740 | $4,940 (1) |
| Range Reconnaissance | 41,400 | 46,520 | 51,520 | 5,000 (2) |
| Total | $108,450 | $121,320 | $131,260 | $9,940 |

The increase of $9,940 is submitted for the following purposes:

(1) $4,940 for timber surveys. The cruising of timber as a part of the preparatory work for sales and for plans of management of the timber resources has not kept pace with the increase in business. If the present rate of increase in timber sale receipts (1928 to 1930) - increase of $1,249,900) is to be continued or even maintained, it means that plans for regulating the cut and estimates as the basis of appraisal must be obtained some years in advance of actual sale. The present appropriation is insufficient to keep this work ahead of the growing sales business.

The increase will be spent largely in Colorado, Washington and Oregon. In Colorado there is a crying need for information concerning available supply of pulp wood species. This demand comes as the result of a recent large pulpwood sale which marks the advent of the paper-making industry in the Rocky Mountain Region. An increasing demand for timber in Washington and Oregon to supply existing mills which are fast cutting out their private timber supply, calls for timber surveys as a basis for the preparation of plans of management to determine the permissible annual cut and so avoid over-cutting.

(2) $5,000 for range reconnaissance. An allotment of $41,450 from the reconnaissance appropriation for 1930 was increased by $4,950 for 1931. Since 1912 about 40,500,000 acres have been surveyed by reconnaissance methods. Approximately 43,000,000 acres of National Forest land used for grazing have not been covered by reconnaissance and lack the basis for accurate and complete management plans. The need for exact knowledge regarding the grazing resources and for comprehensive management plans increases as the pressure for grazing privileges on the National Forests grows stronger; as the number of game animals steadily increases; as recreational use expands; and as watershed and timber protection becomes more urgent. In order that range adjustments may be made wisely and justly as their need arises under these expanding uses it is urgent that 20,000,000 additional acres be covered by reconnaissance within the next five years. Such a program would cost about $80,000 per year or an increase of $33,600 over the present appropriation.

The increase, if recieved, will be expended approximately as follows: Region 1, $1,000; Region 2, $3,000; Region 4, $1,000.

## Activities under this Appropriation

Timber surveys: The first step in the management of the timber resources of the National Forests is the determination of the kinds and amount of timber available in the different units. When this information is obtained it is possible to group together those units which are logically tributary to the same general lines of transportation which will carry the raw material to a common manufacturing center. Once the boundaries of such a unit of operation are decided upon and an inventory had of the merchantable timber and young growth therein, it is possible to determine the amount of timber which can be removed annually without depleting the growing stock or wood capital. All of this information is brought together in what is termed a forest management plan, and such a plan definitely fixes the annual cut and the timber sale policies and systems of cutting to be followed. A great many of these plans have been prepared and a great many more are needed. It is not possible to intelligently plan for future business, nor can the Forest Service properly encourage the investment of capital for the manufacture of its timber unless it rather definitely knows what it has to offer in the way of a permanent supply of raw material.

Timber surveys made to procure this information can be comparatively extensive in character since the cut is planned over a long period of years and there will be opportunity for adjustment. Once capital has been interested and the manufacturing plant assured, it is then necessary to put up a block of timber for sale and since the stumpage prices found in the appraisal are largely influenced by the volume of timber to be cut it is essential that an accurate estimate of the timber be obtained. Thus in preparing for sales of timber two types of survey are needed: (1) an extensive survey to determine how much timber can be cut from the unit annually (a preliminary examination). and (2) intensive surveys at frequent intervals of portions of the unit to fix the value of the stumpage for individual sales.

Range Reconnaissance: Plans of management are prepared to govern the handling of the forage resources of the National Forests. The range is divided up into grazing allotments - units of a size to accommodate the stock of a single individual or a group of individuals. Each allotment has a plan of management prepared for it fixing the number of stock which can be grazed without reducing the productivity of the area. It provides for the manner in which the stock shall be grazed, the order in which the different units within the allotment shall be grazed as the season progresses, the location of the salt grounds and the supervision necessary to obtain the best utilization of the range.

Most of the grazing allotments at present have a plan of management of some nature but many of them are based on very incomplete information. In order that the best use of this grazing resource may be obtained it is essential that basic information be obtained by a grazing survey of the 20,000,000 acres still to be covered. These surveys determine the number and kinds of forage plants found per acre on the range, their palatability, period of seeding and such related data and furnish a basis for determining the carrying capacity of the different units. Without this information it is simply a question of "trial and error" with the very serious probability of doing damage by over grazing which will require years to correct and further to seriously impair the watershed values of the grass cover.

## (j) IMPROVEMENTS, NATIONAL FORESTS

Explanation of change in language: The limitation on the amount which may be expended for the construction and maintenance of range improvements has been increased to $120,000 and the amount in the special proviso relative to roads and trails has been increased to $1,650,000 to provide for increases recommended under these items.

| | |
|---|---|
| Appropriation, 1931..... | $2,500,000 |
| Budget, 1932..... | 2,780,000 |
| Increase | $ 280,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase | |
|---|---|---|---|---|---|
| Protection Improvements | $234,000 | $ 541,000 | $ 631,000 | $ 90,000 | (1) |
| Protection Roads & Trails | -- | 1,500,000 | 1,650,000 | 150,000 | (2) |
| Southern California Improvements | 124,400 | 150,000 | 150,000 | -- | |
| Range Improvements | 84,600 | 100,000 | 120,000 | 20,000 | (3) |
| Administrative Improvements | 199,000 | 209,000 | 229,000 | 20,000 | (4) |
| Total | $642,000 | $2,500,000 | $2,780,000 | $280,000 | |

The increase of $280,000 is submitted for the following purposes:

(1) $90,000 for construction and maintenance of protection improvements: Although the creation of the National Forests was authorized by the Act of June 4, 1897, and most of these Forests have been under Federal management for over twenty years, it is necessary to say that in many instances they still lack the most rudimentary improvements necessary for their protection. The additional investment necessary to complete an adequate system of protective improvements would be relatively small, when compared to the values at stake and the amounts expended for personnel and particularly the amounts expended for suppression of fires after they have grown large and difficult to handle.

The protection of the National Forests calls for an investment in a protection plant which it has not been possible to make with current appropriations. The critical part played in fire losses by lack of protective improvements has been strongly emphasized by the experience of the season of 1929 and in numerous previous years. It is hoped that appropriations may be approved which are reasonably commensurate with the size of the undertaking. The needed improvements must be constructed some time. The sooner the job is completed the sooner will the wastage of the resources on these public properties be stopped.

It is anticipated that the $90,000 increase will be used for project work on the following classes of improvements:

| | |
|---|---|
| Construction of telephone lines | $42,000 |
| Construction of fire breaks | 10,000 |
| Construction of lookout structures | 28,000 |
| Construction of other buildings | 10,000 |
| Total | $90,000 |

If the increase is received, it will be expended approximately as follows: Region 1, $34,000; Region 2, $1,500; Region 3, $1,000; Region 4, $2,700; Region 5, $16,000; Region 6, $29,000; Region 7, $2,700; Region 9, $3,100.

(2) $150,000 for the construction and maintenance of protection roads and trails: All experience in fire protection emphasizes the necessity of catching fires small if losses are to be prevented and the costs of fire fighting are to be kept within reason. Success in catching fires while small depends on speed in reaching them and this in turn depends largely on roads and trails. When roads and trails are available fires are reached promptly and are normally either controlled at once or rounded up within the first twenty-four hours. In the disastrous season of 1929 in north Idaho and Montana, no fire escaped which started within striking distance of a road.

An analysis of California National Forest Fires of over 100 acres in 1928 which were not rounded up within the first twenty-four hours shows that 29 per cent of such failures are attributable to lack of roads and trails.

Under existing legislation approximately $3,000,000 is appropriated annually from the Forest Road and Trail appropriation for the construction and maintenance of roads and trails needed for the protection and development of the National Forests. This program, however, must provide for roads needed for administration and utilization of timber, and other resources, as well as for strictly protection needs.

The increase of $150,000 in the Improvement appropriation will be expended exclusively for project work on roads and trails needed for protection purposes, and will make it possible to speed up the construction program. The expenditures by Regions will be approximately as follows: Region 1, $57,500; Region 3,

$2,000; Region 4, $4,500; Region 5, $30,000; Region 6, $43,000; Region 7, $8,000; Region 9, $5,000.

An appropriation of $1,500,000 was received for 1931 for this work, but the program of establishing a transportation system adequately meeting the needs for protection can not be carried out at a satisfactory rate without the further increase requested.

(3) $20,000 for construction and maintenance of range improvements: Range improvements consist of: drift, division, and boundary fences; water development projects, driveways; eradication of poisonous plants, cabins, bridges, corrals, and pastures. It is through the construction of these forms of range improvements that National Forest land is more adequately protected and made more usable. As a necessary safeguard to the continued productivity of the forage crop they make possible the control of the stock to a given area at the right time of the year. They involve the improvement of range lands through the development of water and the eradication of poisonous plants on range lands not now usable. Their construction further means a reduction of administrative expense in the patrol of forest boundaries and in the prevention of trespass.

A special reason for increased appropriations for range improvements lies in the fact that increased grazing fees are being put into effect which more nearly represent the commercial value of the grazing privileges than did the former fees. While the permittees have been willing to expend money for range improvements because they realized they were paying low grazing fees, they are unwilling to continue, with their own funds, to construct these improvements when the grazing fee more nearly approximates the real commercial value of the use of the forest range. In view of this situation the Secretary of Agriculture in 1927 pledged his support to an adequate appropriation that would enable the Government to construct the necessary improvements on the forest ranges. Failure to receive this increase will prevent reasonably good management and utilization of National Forest ranges, and will also prevent the Federal Government from carrying through in good faith its part of a general program of increasing receipts from these ranges.

The increase if received will be expended approximately as follows: Region 1, $2,000; Region 2, $2,000; Region 3, $8,600; Region 4, $3,400; Region 5, $2,000; Region 6, $2,000.

(4) $20,000 for construction and maintenance of administrative improvements: The administration of 159,000,000 acres of National Forest lands, largely in undeveloped regions, unavoidably requires a certain minimum of structures such as dwellings for District Rangers and others who must be stationed away from towns and cities, cabins for the shelter of men and equipment at frequently used points on the routes of travel followed in the course of administrative work, barns for the care of animals, shelter for machinery and motor vehicles, simple office buildings, in which records can be kept and necessary office work performed and business transacted with the users of the forests, pasture fences and water development at stations from which administrative activities are carried on. The urge to make the utmost progress with the development of improvements needed specifically for protection has inevitably involved postponement of needed administrative improvements and neglect of the maintenance of such structures as have been built.

Because of the extreme diversity of the resources involved, the kinds of business and work carried on and the impossibility of such close supervision as is appropriate where work is concentrated in a factory or an office building, it is necessary that even in District Ranger positions men be employed who have an un-

usual degree of resourcefulness, intelligence, initiative, and responsibility. Men of this type can not be held when they and their families are expected to live in inadequate, dilapidated or poorly maintained quarters. In too many instances this is the case at present and the increase will be applied in curing this situation. No quarters are constructed when it is possible for employees to rent suitable structures at the locations at which they must be stationed. When quarters are furnished, suitable deductions are made in the pay of employees so that in effect the Government investment is returned in time from salaries of employees.

An increase of $9,000 in the 1931 appropriation was made for construction and maintenance of administrative improvements and it is estimated that expenditures for this activity in the fiscal year 1931 will be $209,000. This amount is inadequate to maintain existing administrative improvements, provide for replacements, and needed administrative improvements for new administrative units acquired by purchase.

If the increase is received, it will be expended approximately as follows: Region 1, $1,350; Region 2, $1,350; Region 3, $2,450; Region 4, $3,300; Region 5, $2,450; Region 6, $3,300; Region 7, $2,900; Region 8, $600; Region 9, $2,300.

## Activities under this Appropriation

At the present time this appropriation is used for the construction and maintenance of improvements needed for the administration and protection of the National Forests, except camp ground improvements. There is a special appropriation for the latter class of improvements. There is also a separate appropriation for forest roads and trails, a part of which is used for the construction and maintenance of roads and trails of the same general class as those constructed under this item. The principal classes of improvements constructed and maintained are telephone lines, lookout structures, fire breaks, roads, trails, barns, fences, dwellings and other buildings.

Limited amounts are used for the special protective improvements on the Angeles, Cleveland, Santa Barbara and San Bernardino National Forests in southern California and for the construction and maintenance of boundary and range division fences and other improvements necessary for the control of stock on the grazing ranges on the National Forests. The appropriation is largely used for materials and their transportation to point of use, every effort being made to supplement this special appropriation by utilizing the time of fire guards and rangers during the intervals when their services can be spared from protective and other duties for which they are primarily employed.

General Statement - Forest Research

The increases recommended for forest research, and more specifically for research in forest management, range investigations, forest products, forest survey, and forest economics for the fiscal year 1932, fall under the provisions and the authorizations of the Forest Research Act approved May 22, 1928 (45 Stat., 699-702).

Except for the forest survey item, Section 9, which provides a maximum as well as an annual authorization, the Act of May 22, 1928, sets up a 10-year financial program which began with the fiscal year 1929 and ends with 1938. The year 1932 will be the fourth year of this program.

Each section of the Act provides for work on an important phase of the forestry problem. Forest management, on how to grow timber crops and protect them against fire; range investigations, on the production and utilization of forest ranges, an important by-product, and also on other ranges; forest products investigations, on the properties, manufacture, and utilization of forest products primarily as an aid to forest land use; the forest survey and other economic investigations, on the formulation of the economic basis for sound forest policies.

All of the above recommendations therefore constitute parts of a comprehensive regional and national attack through research on the forest problems of the United States.

In the broadest sense the objectives of the comprehensive program outlined by the forest research act are to supply a scientific foundation for:

1. The productive use of forest land in the United States, which aggregates about one-fourth of our entire land area, an area nearly as large as that now classified as improved agricultural land.

The productive use of forest lands includes the growing of wood and other forest products sufficient to meet American requirements, which are now nearly half of world requirements. Productive use includes also, in connection with erosion-stream flow investigations, making lands most effective for watershed protection, and for assuring satisfactory production and use of the forage, wild life, recreational, and other forest resources.

Productive use is important because present-day American standards of living require a relatively high per capita consumption of wood, and these standards should not be lowered by a shortage. Productive use is important also because idle land is an economic burden. Surrounding and more prosperous districts must, for example, contribute to the support of the sparse populations through increased taxation. Productive use is important because the permanence of forest industries depends

absolutely upon continuous wood supplies. As a group these industries rank about fourth among American industries and have a capitalization of about $3,600,000,000 exclusive of forest land and stumpage worth at least $10,000,000,000 more.

Bringing and maintaining forest lands in productive use is a complex and difficult problem. Within the forest regions of the United States there are wide variations in topographic, climatic, soil, and other conditions. Out of a total of about 850 forest tree species we have something like 63 of high commercial value. The forest management of most European countries deals with only two or three species--fewer, in fact, than are found in any one of our important forest regions. Back of European forest practice are many decades or even centuries of tradition. In the United Staes we are starting from scratch. Conditions affecting production and use of forest ranges are equally variable and complex.

2. The productive use of range land in the United States. Approximately 237 million acres of forest land are grazed in the United States, from which forage constitutes an important by-product. In addition there are about 587 million acres of untimbered range lands. The greater part of this vast area of timbered and non-timbered range land is in the West, where it furnishes about 70 per cent of the feed for the livestock industry of the 11 Western States and a considerable part of the water for the 19 million acres of irrigated land. A large part of it is Federally owned. Most of it outside the National Forests is producing less than 50 per cent of what it is capable, and large areas are probably not producing more than 10 per cent of what they are capable. Utilization of areas adjacent to the National Forests has a very direct relationship with the proper handling of the range on the National Forests.

3. Reduction of waste in the manufacture and utilization of wood, which is now responsible for about two-thirds of the annual cut from our forests; and also for the effective utilization of the many species of wood which are consumed by the American public.

The primary benefits accrue to forest land owners by making timber growing more profitable, and to the ultimate consumer of wood through better service.

The difficulty and complexity of forest products work is increased through the large number of American tree species and because of the great variation in the properties of single species. This variation in one sense is a liability, but it may be made an asset through full scientific information.

4. Sound economic forest land policies - Federal, State, regional, etc. Enough information on our forest situation is now available so that we know along broad lines what action must be taken. Detailed policies can not be formulated satisfactorily until authentic and detailed data can be made available.

Forestry activities in the United States are expanding rapidly. Current expenditures by all agencies now probably reach over $40,000,000

a year. Every dollar should be made to count to the utmost. This can be assured only through the sound technical basis which can be obtained through research.

While as yet only partly in effect, the objective toward which the Forest Service is working is to place regional research in forest management, range research, the forest survey, and forest economics, and some of the purely local work in forest products, at regional Forest Experiment Stations, and to continue the Forest Products Laboratory as a national institution dealing with national utilization questions, those which require laboratory facilities, and the local products research which does not justify a permanent local staff.

## (k) RESEARCH IN FOREST MANAGEMENT

In accordance with the provisions of the Act approved May 22, 1928 (45 Stat., 699-702), and under the Section 2 maximum authorization of $1,000,000 for research in forest management:

| | |
|---|---|
| Appropriation 1931 - - - - - - - - - - - | $488,500 |
| Brookhart Act adjustments - - - - - - - - | 1,840 |
| Transfer from Equipment and Supplies appropriation*- - - - - - | 4,000 |
| Total for 1931 - - - - - - - - - - - - - - | $494,340 |
| Budget, 1932 - - - - - - - - - - - - - - - | 547,000 |
| Increase - - - - - - - - - - - - - - - - - | $ 52,660 |

*Transfer to this appropriation proposed in Budget, 1932.

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Research in Forest Management: | | | | |
| Appalachian Forest Experiment Station, headquarters at Asheville, N.C. ... | $40,100 | $45,220 | $45,220 | . . |
| In the Rocky Mountain Region ..... | 5,200 | 5,300 | 5,300 | . . |
| Pacific Northwest Forest Experiment Station, headquarters at Portland, Ore. ..... | 28,900 | 29,580 | 44,580 | $15,000 (1) |
| Northern Rocky Mountain Forest Experiment Station, headquarters at Missoula, Mont. ..... | 20,227 | 20,697 | 35,697 | 15,000 (2) |
| Lake States Forest Experiment Station, headquarters at St. Paul, Minn. ... | 68,583 | 69,223 | 69,223 | . . |
| Northeastern Forest Experiment Station, headquarters at Amherst, Mass. ..... | 28,420 | 28,870 | 48,870 | 20,000 (3) |
| Southern Forest Experiment Station, headquarters at New Orleans, La. | 49,400 | 79,350 | 79,350 | . . |

| Project (continued) | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Southwestern Forest and Range Experiment Station, headquarters at Tucson, Ariz. ..... | $9,900 | $10,300 | $12,960 | $ 2,660 (4) |
| California Forest Experiment Station, headquarters at Berkeley, Calif..... | 34,300 | 63,910 | 63,910 | .. |
| Intermountain Forest and Range Experiment Station, headquarters at Ogden, Utah ..... | .. | 10,000 | 10,000 | .. |
| Central States Forest Experiment Station, headquarters at Columbus, Ohio ..... | 30,510 | 30,760 | 30,760 | .. |
| Allegheny Forest Experiment Station, headquarters at Philadelphia, Pa. ..... | 31,220 | 31,470 | 31,470 | .. |
| Washington, D.C. ..... | 66,140 | 69,660 | 69,660 | .. |
| Totals ..... | $412,900 | $494,340 | $547,000 | $52,660 |

The increase of $52,660 is submitted for the following purposes:

(1) $15,000 to determine the best methods of preventing and suppressing forest fires by the Pacific Northwest Forest Experiment Station.

(a) Fire is the greatest menace to keeping forest lands productive. In spite of great progress in protection, fires in the Pacific Northwestern States of Washington and Idaho are so numerous, severe, and cause such heavy losses to the private timberland owner and to the public that it is one of the most critical regions in the United States. In 1926 there were 3,786 fires, of which 75 per cent were man-caused. Over 581,000 acres were burned, causing an estimated damage of $3,500,000. In 1929 there were 1,573 fires on the National Forests of this region alone, which burned over 400,000 acres of Government land, costing $953,000 to control and causing an estimated loss of $2,500,000.

Present protection is based upon trial-and-error methods, and lacks a scientific basis both for the organization necessary to catch fires while small and for the control measures necessary on large fires. Specific knowledge is also lacking as to the actual physical damage done by fires in the various types. This lack prevents the wise allocation of protection funds for fire control purposes in these types.

(b) The plan of the Department will be:

To determine by forest types; the hour control standards or speed of attack and organization necessary to discover, reach, and extinguish fires while they are small; the damage caused to

young growth, old growth, cut-over areas, etc., as the basis in part for the allocation of protection funds; how going fires behave under different conditions of forest cover, topography, weather, etc., and the most effective tactics and methods for suppressing them.

(c) Present work:
$5,000 is being spent upon fire research in this region, upon the fire problem created by slash left in logging, and upon static as an indicator of the local occurrence of lightning storms.

(2) $15,000 to determine the best methods of preventing and suppressing forest fires by the Northern Rocky Mountain Forest Experiment Station.

(a) Forest fires in this region are so frequent and destructive and timber values are so high that northern Idaho and western Montana is probably the most critical region in the entire United States. in 1929 the damage caused by 1,949 fires within the National Forests was $2,272,000, while it cost $1,697,000 to control them. In 1926 the damage was nearly $5,000,000, of which over $4,000,000 was on National Forest lands. Because of the repeated failure of protective organizations to cope with the fire situation in this region, several of the large private protective enterprises have reached a point where they can no longer see their way clear to give adequate protection to forest lands other than those which contain timber stands of high value. This means a serious handicap in reforestation and the growing of timber on both private and public lands. Assistance can be given to these organizations and to the National Forests through research, a form of attack which as yet has received little emphasis.

(b) The plan of the Department will be:

To determine for different types and forest conditions; the standards of hour control or speed of attack, together with the detection and organization, necessary to extinguish fires while small; how going fires behave under varying conditions and the methods and tactics which are most effective for suppressing them; and the direct and indirect damage that fires cause as a basis in part for the best allocation of funds.

(c) Present work:

At present $6,000 is being spent upon fire research at the Northern Rocky Mountain Station primarily upon the occurrence, etc., of lightning storms, which are responsible for approximately two-thirds of the forest fires in this region and upon the relative inflammability of forest fuels in relation to weather conditions.

(3) $20,000 for research in forest management by the Northeastern Forest Experiment Station for the following two purposes:

(A) $10,000 for investigations of forest planting.

(a) Over 10,000,000 trees were distributed to farmers in the Northeast in 1929 (8,000,000 by New York and 2,250,000 by the New England States), under Section 4 of the Clarke-McNary Act. In this distribution the Federal Government bears part of the cost. In addition, 12,500,000 trees were planted on private lands other than en farms, and 10,500,000 trees were planted on State lands. Forest planting in the Northeast is therefore progressing at the rate of about 35,000,000 trees a year and programs for expansion are under way in all the States.

New York plans to expend $20,000,000 over a 15-year period to purchase and reforest 1,000,000 acres of idle land, of which it has over 4,000,000 acres. Maine has over 1,000,000 acres of idle land in need of reforesting. In New York submarginal farm lands are being abandoned at the rate of over 250,000 acres a year, about ten times the present rate of reforestation. In New England as a whole, some 6,000,000 acres of farm land have been abandoned in the past 50 years.

There is no comprehensive information on the results of planting to help avoid costly mistakes, and wide differences of opinion exist on nursery practice, planting technique, and species to be planted. Trees have been planted on soils unsuited for their growth. None of the public nurseries are producing hardwood species for forest planting, yet forests of mixed conifers and hardwoods are believed to be more desirable than pure stands of conifers alone. Mixed stands produce more wood per acre, yield timber of higher quality, are less subject to insect and disease attack, and tend to increase the fertility of the soil. Few or none of the plantations have been made with selected seed and disheartening failures have resulted. Research is therefore necessary to furnish the sound basic knowledge for reforestation.

(b) The plan of the Department will be:

As a first step, a survey of the very large number of existing plantations of all species and ages through out the region will be made to obtain as fully as possible the benefit of past success and to avoid the repetition of past mistakes. Such a survey should give facts for immediate application and bring out the questions that should have more extended investigation.

(c) Cooperation:

It is probable that cooperation can be secured from State forest services or other State organizations in several of the States to be covered.

(d) Present work:

No work of this character is now being done.

(B) $10,000 for a study of growth and yields of the northern hardwoods.

(a) About one-half of the forest area of the Northeast (New England and New York), or some 20,000,000 acres, is included in the northern hardwood forest in which birch, maple, and beech predominate, and in which spruce and fir are sometimes important species. The rapid exhaustion of the old-growth hardwood stands in the Lake States and the South and the growing scarcity of pulpwood is developing increasing interest in these stands. Little is known of the growth rate of these hardwoods or how to cut them and insure reforestation. Methods of cutting now used frequently wreck the remaining stand.

(b) The plan of the Department will be:

To obtain data on the growth rate of these species under different conditions of soil and climate, which is the data most needed at present as a basis for forest management. This will enable the forest owner to determine the volume of wood which can be grown from his forest land. This work will be followed by the determination of methods of cutting which will insure natural reforestation, of methods of slash disposal, and of cultural measures such as thinnings, etc.

(c) Present work:

No work is being done on the northern hardwood forest at the present time.

(4) $2,660 for investigations of methods of insuring natural reforestation in Douglas fir and western yellow pine forests by the Southwestern Forest and Range Experiment Station.

(a) One of the problems of forest management in Arizona and New Mexico is that of getting new forest growth started on the cut-over lands, especially in the Douglas fir type. It is almost entirely a problem of National Forest administration. Conditions are severe and methods applicable to the Pacific Northwest do not apply. The long, hot summers are without the high humidity and abundant rainfall that characterizes the Douglas fir region generally, and the soils are radically different.

Although the cutting of Douglas fir in the Southwest has been done under methods which should apparently have resulted in the early establishment of fir reproduction, it has not been obtained. Seed trees produced seed, the ground appeared to be in excellent condition for new growth, but the seeds failed to germinate, or if they germinated the seedlings failed

to survive. Somewhat similar problems exist in the western yellow pine type and their solution lies in research.

(b) The plan of the Department will be:

To make a study of seed production and the factors affecting seedling growth and survival of the Douglas fir. It will be necessary to follow up intensively cuttings of different character, thinnings, slash disposal, grazing, etc., to discover what might be done to obtain the right conditions for the survival of the seedlings. As this work progresses it will be necessary to extend it to the fundamental causes of failures in the western yellow pine type where somewhat comparable difficulties exist.

(c) Cooperation:

Cooperation will be arranged with the University of Arizona, which is planning a fundamental study of the factors which influence the growth, etc,, of various types of vegetation in the State, but is handicapped by inadequate resources.

(d) Present work:

No work is being done on reproduction in the Douglas fir forests or on the fundamental causes of failures of obtaining reproduction in western yellow pine forests.

## Activities Under This Appropriation

The purpose of investigations in forest management is to find out how to grow timber crops under the widely different conditions found in the United States and of the unusually large number of species which make up our forests. It is also to find out how to protect these forests against fire. The work is conducted primarily at a series of regional Forest Experiment Stations, one for each of the major forest regions of the United States. The work includes investigations, of seed production, extraction, storage, germination, etc., of the technique for the production of forest tree seedlings in nurseries, and of field planting; of methods of cutting mature timber so as to insure prompt natural reforestation of the best species; of cultural measures such as thinning and weeding to insure rapid growth throughout the life of the stand; of the rate at which various species and combinations of species grow on different sites; of the conversion of the ragged and inferior forest resulting from cutting and fire into rapidly growing forests of desirable species; of the cultural methods necessary for the production of such by-products as naval stores. Investigations in fire protection cover the

determination of the standards and organization necessary for effective protection, of the damages caused by fire under different forest and other conditions, and of the basis for a satisfactory technique for fire suppression.

The character of the results obtained are illustrated by the following. Germination for fresh white pine seed was found to be 40 per cent only in a few cases. Methods of storage and temperature treatment prior to sowing have been developed which give an average germination percentage of 64.4 per cent. Preliminary work on the source of Norway pine seed indicated that for successful plantations seed must be taken from areas with closely comparable climatic conditions. It was found that Douglas fir seeds were distributed in quantity by light winds up to 1200 feet from the point of release, and this and related facts have a very direct bearing on the number, distribution, and location of seed trees. It was found also that surface soil temperatures on soil blackened by Douglas fir slash fires reached as high as 144° F., or sufficient to kill the seedlings, whereas no such mortality was observed on unburned mineral soil. It was feund for eastern spruce that nearly total dependence for reforestation must be placed upon advance growth of reproduction, important because of the practically universal practice in lumbering of destroying nearly all advance growth. Forest fire investigations show that the ratio of the rate of spread of forest fires in chaparral types in California and that of the fir types is more than 50 to 1. Other work in California shows that a three-quarter-hour control, or the time between start and attack, will on the average be required for the yellow pine, mixed conifer, brush, grass, and woodland types, whereas a four-hour control is sufficient for the sugar pine and fir types.

## (1) RANGE INVESTIGATIONS

In accordance with the provisions of the Act approved May 22, 1928 (45 Stat., 699-702), and under the Section 7 maximum authorization of $275,000 for range investigations:

| | |
|---|---|
| Appropriations, 1931..... | $85,000 |
| Brookhart Act adjustments.... | 360 |
| Transfer from Equipment and Supplies appropriation.. | 400* |
| Total, 1931..... | 85,760 |
| Budget, 1932 ..... | 120,000 |
| Increase ..... | 34,240 |

*Transfer to this appropriation proposed in Budget, 1932.

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Research in Range Management: | | | | |
| Intermountain Forest and Range Experiment Station, headquarters at Ogden, Utah..... | $28,550 | $37,550 | $37,550 | --- |
| Southwestern Forest and Range Experiment Station, headquarters at Tucson, Ariz..... | 20,040 | 26,950 | 41,190 | $14,240(1) |
| California Forest Experiment Station, headquarters at Berkeley, Calif..... | --- | --- | 20,000 | 20,000 |
| Washington, D. C..... | 18,400 | 21,260 | 21,260 | --- |
| Totals ..... | 66,990 | 85,760 | 120,000 | 34,240 |

(1) $14,240 for range investigations by the Southwestern Forest and Range Experiment Station for the following two purposes:

(A) $7,120 for studies of the relation of water to damage by sheep to western yellow pine reproduction.

(a) The western yellow pine lands, occupying some 6,000,000 acres in Arizona and New Mexico, are the chief spring and summer ranges for sheep in the region and are, therefore, a vital factor in fat-lamb production. Sheep grazing in this type frequently causes damage to forest reproduction which is sometimes so severe that it prevents total restocking for many years or indefinitely.

The first satisfactory explanation of irregularity in damage appears to be the theory that damage to reproduction results from lack of water. The protection of reproduction is important since the lumber industry ranks fifth among those of the Southwest and its future depends largely upon the timber grown on the National Forests. Over 500,000 grown sheep are permitted on the National Forests every year. Upon the solution of the problem, therefore, largely depends the future welfare of the lumber and an important part of the sheep industry of the region. In the Agricultural Appropriation Act for the fiscal year 1931, $8,000 was made available for the study of this problem on cattle ranges.

(b) The plan of the Department will be:

To determine the relationship between damage to western yellow pine reproduction by sheep and the availability of water, and to work out satisfactory forms of range management based on these relationships and such other factors as may be necessary. Forms of management in addition to safeguarding the forest should permit profitable sheep production. Work will be done in both virgin forests and cutover areas.

(c) Present work:

No funds are available for the water relationship studies on sheep ranges. About $2,000 will be spent for related studies of range management (seasons; degrees, etc. of utilization) of timbered areas grazed by sheep.

(B) $7,120 for studies of ways and means of restoring range vegetation on southwestern sand dunes and denuded gravelly ridges.

(a) The most seriously depleted parts of the semi-desert ranges in New Mexico and Arizona are the sand dunes and the gravelly ridges. The 16,000,000 acres making up these sore spots are not producing one-tenth of what they are capable, and their present condition seriously interferes with satisfactory utilization on an additional 35,000,000 acres of better lands with which they are intermingled. They are also the main contributing areas to the excessive sediment carried by southwestern floods with their resultant damage to farm and urban property and silting of reservoirs. The problem is one of reestablishing productive soil and suitable plant cover. On its solution largely depends the permanent welfare of the range livestock industry dependent upon the semi-desert ranges, upon which graze nearly 2,000,000 cattle and sheep yearlong and also over 800,000 additional livestock for the winter.

(b) The plan of the Department will be:

To determine ways and means of reestablishing a suitable plant cover and of soil conditions which will support it; also of range management which will insure the perpetuation of a suitable plant cover.

(c) Cooperation:

The University of Arizona is planning an intensive study of the fundamental factors which influence various types of plant development, which will be of great help in the solution of this problem. Some phases of the work will be handled in cooperation.

(d) Present work:

No work is being done on these sore spots. Related work on the management of the better semi-desert ranges on the Jornada and Santa Rita branches of the Southwestern Station involves expenditures of $15,150.

(2) $20,000 for range investigations by the California Forest Experiment Station for the following two purposes:

(A) $10,000 for studies of range management in the California pine types.

(a) These types occupy 10,000,000 acres and form the main timber growing belt of the State. The more valuable parts are being cut over rapidly and reproduction is difficult to secure. On these pine lands 90 per cent of the livestock grazing on the National Forests of California are pastured during each summer. These lands also form the main headwaters of the San Joaquin and Sacramento River watersheds. The long, dry summers make maintenance of forest growth difficult and bring about serious damage to range, timber, and watersheds from improper grazing management. Several dry years have so depleted the forage supply that it has made the problem extremely critical.

(b) The plan of the Department will be:

To determine the extent to which grazing is causing injury to timber reproduction on cut-over lands or on lands about to be cut; what methods of range management might be applied to overcome this damage and harmonize grazing with timber growing; what grazing measures are necessary to maintain the vegetative cover found necessary by erosion-streamflow investigations how needed adjustments can be brought about and yet assure a permanent profitable use of forage by livestock.

(c) Present work:

No research is being done in this region.

(B) $10,000 for studies of range management in the foothill winter ranges by the California Forest Experiment Station.

(a) These foothills, comprising 20,000,000 acres constitute the principal fall, winter, and spring ranges of central California, and form an important link between the stubble fields and feed lots of the valleys and the summer range in the mountains. Their improvement and satisfactory maintenance is vital to the welfare of the livestock industry and of the valuable watersheds of the great central valleys. They are used principally for spring-lamb and beef production, which requires abundant and succulent range feed, and this can only be assured by good management. Since the occupation by the white man the grazing capacity has been decreasing steadily, accompanied by the conversion of desirable forage types to those having largely non-palatable, highly inflammable brush species, which greatly increases the forest and brush fire hazard of the region. In attempting to convert these undesirable brush lands to better grazing areas, fires have been set which have destroyed soil and forage values.

(b) The plan of the Department will be:

To determine what forage these ranges can be made to support; what practical management can be developed to assure the most profitable use in the winter and spring period; what management is necessary to insure the perpetuation of the cover found necessary by erosion-streamflow studies for erosion control and streamflow regulation; and the effect of fires upon the character and amount of forage production and of grazing to the amount and character of inflammable materials. It is planned to begin the work in the San Joaquin foothills.

(c) Present work:

No work is being done on this problem at the present time.

Activities under this Appropriation.

The object of range investigations is to find out how to produce and utilize forage crops on forest and other range lands. The work is now centered at the Intermountain Forest and Range Experiment Station, and on a smaller scale at the Southwestern Forest and Range Experiment Station. Increases recommended for the current year will put that of the latter Station on a fairly satisfactory basis and provide for the initiation of work in California. No work is under way in any other region. Range investigations include the determination of suitable methods for restoring and maintaining

forage crops and the proper utilization of these crops by domestic livestock; the correlation of grazing management with timber production; artificial reseeding with native and cultivated forage plants; range livestock management including systems of handling different classes of stock, water development, salting, etc., and the eradication or control of poisonous plants.

The following examples illustrate the character of the results which are being obtained. An analysis of 15 years' work at the Jornada Experimental Range in Arizona indicates that the black grama, one of the most valuable local forage grasses, should be used in winter and spring when cured, and when so used may be maintained as a dominant species provided that stocking of the range is 15 per cent below what the range will carry in an average year. The analysis shows also that tobosa grass, another of the most valuable forage grasses, can best be utilized in summer when it thrives under close use. Studies of spring-fall range utilization by sheep in central Idaho show that close use from the time growth begins in the spring until the end of the growing season in June, followed by full use in the fall, resulted in the loss of 65 per cent of carrying capacity by the end of the seventh year, accompanied by a great increase in the stand of inferior and worthless range plants. These studies also show that equally good results in yearlong carrying capacity can be obtained under spring utilization when the vegetation is five or six inches high and when grazing is deferred until the fall of each year, provided that in both cases stocking is restricted to 15 per cent less than the range will carry in an average year.

## (m) FOREST PRODUCTS INVESTIGATIONS

In accordance with the provision of the Act approved May 22, 1928 (45 Stat., 699-702), and under the maximum authorization of Section 8 of $1,000,000 for forest products investigations:

| | |
|---|---|
| Appropriation, 1931 ..... | $635,000 |
| Brookhart Act adjustments..... | 4,300 |
| Transfer from Equipment and Supplies appropriation ..... | 2,000* |
| Total, 1931..... | 641,300 |
| Budget, 1932..... | 675,000 |
| Increase..... | 33,700 |

*Transfer to this appropriation proposed in Budget, 1932.

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Forest Products Investigations: | | | | |
| Forest Products Laboratory, Madison, Wis..... | $478,500 | $531,580 | $565,280 | $33,700 |
| Northern Rocky Mountain Region, headquarters at Missoula, Mont..... | 15,000 | 15,500 | 15,500 | --- |
| Pacific Northwest Region, headquarters at Portland, Oreg. . | 18,420 | 19,320 | 19,320 | --- |
| California Forest Experiment Station, headquarters at Berkeley, Calif. ..... | 17,200 | 17,550 | 17,550 | --- |
| Washington, D. C. ..... | 55,180 | 57,350 | 57,350 | --- |
| Totals ..... | 584,300 | 641,300 | 675,000 | 33,700 |

$33,700 for investigations of forest products at the Forest Products Laboratory, for the following three purposes:

(A) $15,000 to develop an anti-shrink treatment for wood.

(a) One of the two or three outstanding drawbacks to the successful and satisfactory use of wood in many places lies in the fact that wood swells and shrinks with changes in atmospheric humidity. The resulting defects are well known and generally recognized wherever wood is used. The normal swelling of wood in the summer, resulting from increased atmospheric humidity, causes doors, windows, and screens to stick, furniture drawers to jam, and panels to warp. Flooring laid tight in the winter often buckles during the succeeding summer. The use of wooden flooring in buildings of fireproof construction has fallen off materially in recent years because the contractors can not wait to let the concrete floor slabs dry out before the wooden floors can be laid with assurance

of safety from subsequent buckling caused by the absorption of moisture. The normal shrinkage of wood during the winter, especially in the colder climates where artificial heat is necessary, results in the rattling of doors and windows, the opening up of cracks in flooring, and the shrinkage of panels, often enough to show wide white edges of unstained and unfinished wood. Unsightly cracks often appear in the interior finish of houses. The combined effects of swelling and shrinking from season to season result, in addition, to the opening up of glue joints in doors, furniture, and chairs, and in the pulling apart of nailed joints in the structure of houses and elsewhere.

The shrinkage of wood with loss of moisture is directly responsible for practically all seasoning defects and losses such as checking, splitting, cupping and warping, and the falling out of knots. An antishrink treatment which could be applied to the green lumber would eliminate all of these defects and losses.

The specific object of the proposed research is to develop a commercially practical method for the elimination or at least the reduction of the swelling and shrinkage of wood.

(b) <u>The plan of the Department will be</u>:

To attack the problem by two methods. The first consists of exploratory research such as trying various kinds of chemicals, heat treatment, etc., and of following up the leads developed.

The second consists of a fundamental study of the physical properties of the minute structure of the wood as a foundation of a method for reducing or eliminating swelling and shrinking. Studies of this kind have not been made heretofore upon any extended scale, in part because suitable laboratory methods have not been developed. Now, however, the progress of science has made available a group of technical methods for studying the properties of microscopic and sub-microscopic bodies or units which are called "physical-chemical" methods. They lie in the borderland between purely physical and purely chemical methods. Some of these methods involve the use of the x-ray and ultra-violet light, and the recently developed super-centrifuge. A study of the electrical properties of the microscopic or sub-microscopic units of wood in their relation to cohesion and adhesion is involved. A thorough knowledge of the physical properties of the minute structure of wood is necessary before we can understand the exact mechanism by which wood actually swells and shrinks. That mechanism is not known now and until it is our search for methods of reducing or eliminating swelling and shrinking must be largely empirical. Such knowledge will be exceedingly useful for many other purposes, such as the development of better pulps and paper, and the preservative treatment of wood.

(c) Present work:

Related work now under way includes the beginning of a study of the effectiveness of injecting various anti-shrink chemicals into wood, with an allotment of $1500; a study of the sub-microscopic structure of the fusiform bodies of which wood fibers are composed, with an allotment of $3400; and a study of wood as a colloid, with an allotment of $4500.

(B) <u>$10,000 to improve the use of wood in frame buildings</u>.

(a) Over 60 per cent of the lumber produced in the United States is used in building construction approximately one-half for farm buildings and one-half for urban residence and industrial buildings.

In this highly competitive field lumber is losing ground because old-fashioned methods of design and wood use are too expensive or inefficient to compete successfully with other building materials and methods developed by engineering and scientific skill. Lumber will be retained in this field to the degree that it can give better service at lower costs by the development of improved construction and through better design and assembly methods and better selection, handling, preparation, and care of the material. The research proposed in this field is aimed at lowering costs and improving service.

The barn roof truss has evolved from the heavy timber type, strong but costly, to an extremely light construction often unsatisfactory from a strength standpoint. It is important to develop information whereby suitable light barn roof trusses can be made at low cost through the utilization of short-length, narrow, low grade lumber. Great economy would also result if designs were developed to utilize factory-cut stock sizes. In industrial and other buildings, joints and fastenings of the structural elements represent the greatest source of weakness. Tests of heavy construction joints and fastening details are needed to develop efficient design. With the development of standard types of joints and fastenings much of the labor now done by hand on the job could be done by machinery in a factory. The increased economy through reduced labor and material cost and better service would be such as to put wood on a satisfactory basis of competition with other materials. The use of built-up girders, columns, and other structural members represents another source of economy in lumber construction.

(b) The plan of the Department will be:

To expand the work on joints and fastenings, including tests of metal devices, the development of girder to column connections, tests of various truss joints, and tests of truss members with various and fastenings; and to make investigations of built-up members, including tests of laminated columns and laminated girders or beams, and a study of the fundamentals of the laminated arch. Much of this work is a necessary preliminary to tests of full-sized trusses, including laminated construction for barns and other buildings.

(c) Present work:

During the current year about $4,300 is being spent on a field survey of frame building problems; $8,000 is being spent on investigations of joints and fastenings, including tests and the preparation of a bulletin covering work done last year.

(C) $8,700 for investigative methods to improve the lasting qualities of paints on wood.

To keep a wood-sided house of moderate size well painted probably costs either in cash or in cash and labor about $50 a year. This is a burdensome cost to many people and as a result they postpone repainting unduly with consequent waste and dissatisfaction. Work done in this field has already revealed some of the causes of very early and disastrous failures of paint and shown how to avoid them, but the studies have also indicated clearly that paint coatings applied according to best modern practice do not retain their protective value and their ability to adhere to wood long enough. Moreover, the manner of failure makes the old coating a poor foundation for the new one and makes the failure occur earlier and more extensively on the kinds of softwood lumber that are most available. If means can be found for making paint coatings adhere to wood more permanently (1) all native softwoods would at once become as economical to maintain with paint as the best of them are now, (2) present day paints would last longer, thereby cutting down maintenance cost, (3) the way would be opened for other improvements in paint serviceableness and durability. There are reasonable prospects of doubling the useful life of paint coatings. For the 12,000,000 wood dwellings in the United States this would amount to an annual saving of $300,000,000.

The plan of the Department will be:

To make an intensive scientific attack on paint adhesion and its variations and the causes as paints age, combined with microscopic observations to show the penetration of oil and pigment into the wood and the relation between wood structure and the nature of failure of paint coatings; to make studies on the mechanism of paint failure due to faulty construction practice and to structural conditions; and to make a comprehensive study of the problem of repainting with the object of determining what plan of paint maintenance gives best results on different woods, using the kinds of paints now available.

Present work:

About $9,700 is being expended on painting investigations at the Forest Products Laboratory during the current year. It provides for the painting with different paints of wooden panels of different species with markedly different characteristics, exposure to the weather on test fences under widely different climatic conditions, and observing and analyzing the rate and character of the deterioration. In addition a publication covering results to date is being prepared.

Activities under this Appropriation.

The general aim of forest products research is to aid in making timber growing more profitable through more efficient utilization, and to aid in providing the public most economically with needed forest products in the form which will render the most satisfactory and efficient service. The enlargement of merchantable yields, the utilization of waste and of species now considered inferior and worthless, and the development of new uses and improved practices are involved. The determination of the chemical composition and physical structure, strength, and other properties of all of our numerous American species is required and how these are affected and may be controlled by conditions of growth. The work also must determine how harvesting and manufacture may be conducted most efficiently and how wastes may be reduced or eliminated. Means must be determined for the selection of material which will take full advantage of the variability in the 30 or more properties of each species and avoid the handicaps of this variability. Closely related is the problem of determining the properties which are important in each type of wood use and the selection of the most suitable and economical woods for each. The work involves the development of methods for modifying wood material, such as making it more resistant against decay, less inflammable, and of developing improved methods of seasoning, storing, and handling from mill or factory to the ultimate consumer. The work must cover the adaptation of material to service through improvement of design in building and other construction. Finally, another group of problems involve the conversion of wood into chemical and fibrous materials such as pulp, paper, fiber board, plastics, etc., and the production and utilization of products such as naval stores.

The following examples illustrate the kind of results which are being obtained. The wood extractives found in such species as black locust, western cedar, and redwood gave to the heartwood a greater crushing strength than the difference in the weight would indicate, but exactly the opposite effect in shock resistance. The work conducted in cooperation with the Southern Forest Experiment Station has resulted in Florida and Georgia in the cancellation by the naval stores factors of all old lease forms and the issuance of new forms stipulating that no tree under 9 inches in diameter shall be tapped. Preliminary analysis of mill scale studies in second-growth shortleaf and loblolly pine indicates that for every thousand feet of lumber cut from trees 10 inches in diameter a loss of $3.29 is incurred, not including stumpage, as compared to a profit of $11.93 for 24-inch trees. It was shown that by greater care in the adjustment of set works on the carriage of small sawmills the value of salable lumber can be increased by as much as $1.60 per thousand. Wide variations in the moisture content of kiln-seasoned lumber were found in a study of Douglas fir to be principally due to inadequate kiln design, and this has resulted in a redesign of kilns to provide greatly increased circulation efficiency. A chart has been constructed by the use of which drying rates under any reasonable combination of kiln temperature and relative humidity can be predicted from characteristics of the wood which can be determined by a relatively small instead of a very large number of experimental kiln runs, as has heretofore been necessary. Water resistant casein glue joints impregnated with creosote or beta-napthol showed practically full strength after 2-1|2 years of continuous exposure to nearly saturated atmosphere, whereas untreated joints failed completely in about half that time. Favorable results previously obtained in the production of strong white pulps from southern loblolly pine were practically duplicated with longleaf pine by a modified sulphate process. An easy bleaching pulp suitable for book, magazine, and writing papers was obtained experimentally by the sulphite process from southern black gum. Highly favorable technical results were obtained with jack pine and other resinous species by using the sulphite process with a soda instead of the usual lime base. The problem of soda recovery is now being studied with a view to the elimination of a great source of stream pollution.

## (n) CONSTRUCTION FOREST PRODUCTS LABORATORY

Explanation of Change in Language. The purpose of the change in language is to make the appropriation recommended for the fiscal year 1932 immediately available. The appropriation of $100,000 for the fiscal year 1931 by the Act of May 27, 1930 (Public No. 272), will not be sufficient to meet the obligations during the remainder of the fiscal year 1931, which the Secretary of Agriculture was authorized to incur under that Act, and construction would be interrupted and delayed.

| | |
|---|---|
| Appropriation 1931 ..... | $100,000 |
| Budget 1932 ..... | 800,000 |
| Increase ..... | $700,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Construction Forest Products Laboratory building | .. | $300,000 | $600,000 | $700,000* |

*Increase to be made immediately available and it is estimated that $200,000 of such increase will be expended in 1931.

The Act of May 27, 1930 (Public No. 272), appropriated $100,000 for carrying out the provisions of the act of April 15, 1930 (Public No. 128), and authorized the Secretary of Agriculture to obligate by contract or otherwise an additional $800,000. The recommended increase of $700,000 over the 1931 appropriation will make the full authorized amount available and thus enable the Department to complete the project during the fiscal year 1932.

The Forest Products Laboratory now occupies all or parts of four buildings furnished by the University of Wisconsin, three of which are located in various parts of the campus and house one-half of the Laboratory staff. Two of the three campus buildings are not permanently available, since the University desires to reoccupy them as soon as possible. The third is a frame structure, originally built as a barrack for soldiers during the World War, which is not adapted to the needs of the Laboratory and which, because of its location near the University's stock pavilion, hog and poultry houses, and barns, has a decidedly unattractive environment. Maintenance and service costs are excessive. Of much greater importance is the loss, much of it intangible, resulting from the separation of Laboratory units dealing with closely related fields of research. In addition to relieving the existing congested condition and providing adequate and suitable quarters for the present staff, it is also highly important that provision be made for the future growth of the Laboratory as contemplated by the Act of May 22, 1928 (45 Stat., 699).

## (o) FOREST SURVEY

In accordance with the provisions of the Act approved May 22, 1928 (45 Stat., 699-702), and under the $250,000 authorization of Section 9 for a forest survey of the United States:

| | |
|---|---|
| Appropriation 1931 ..... | $125,000 |
| Brookhart Act adjustments.. | 100 |
| Total 1931 ..... | $125,100 |
| Budget 1932 ..... | 200,000 |
| Increase ..... | $ 74,900 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Forest Survey: | | | | |
| Pacific Northwest Forest Experiment Station, headquarters at Portland, Oregon . | $31,300 | $74,800 | $74,800 | .. |
| California Forest Experiment Station, headquarters at Berkeley, Calif..... | .. | 5,000 | 5,000 | .. |
| Southern Forest Experiment Station, headquarters at New Orleans, La. | .. | 23,500 | 63,500 | $40,000(1) |
| Lake States Forest Experiment Station, headquarters at St. Paul, Minn. ..... | 5,165 | 8,000 | 8,000 | .. |
| Northern Rocky Mountain Forest Experiment Station, headquarters at Missoula, Mont. ..... | .. | .. | 20,000 | 20,000(2) |
| Washington, D. C. ..... | 3,035 | 13,800 | 28,700 | 14,900(3) |
| Totals ..... | $39,500 | $125,100 | $200,000 | $74,900 |

The increase of $74,900 is needed for a forest survey of the United States, as follows:

(1) $40,000 for a forest survey of the southern pine region by the Southern Forest Experiment Station.

(a) Including 115 million acres of forest land, of which possibly 10 million is still virgin forest, but now supplying 30 per cent of the nation's lumber and 65 per cent of the world's naval stores, this region, including the coastal States from Texas to Virginia, and Arkansas, is unquestionably far overcutting its present annual growth. Half or more of the cut is from second-growth forests, many of which from the regional and the national standpoint, if not from that of the owners themselves, should be held for several or many years. However, under proper management, its yield capacity is estimated at one-fourth that of the entire United States. Present information as to extent, condition, and rate of growth of virgin and second-growth forests is fragmentary, unreliable, and conflicting.

Such an authoritative understanding of the facts as the survey will disclose is of vital importance regionally, because of the economic importance of the forest land resources, and nationally, because of its importance as a supply of forest products.

(b) The plan of the Department will be:

To obtain authoritative data on the quantity, quality, and distribution of the remaining stands of timber, the rapidity with which it is being cut and destroyed by lumbering, fires, insects, diseases or other causes, the current rate of replacement by new growth and potential future growth, present and probable future requirements for timber, the acreage and condition of forest land, and such other data as may be necessary as a basis for State, regional, and national forest policies. This initial work in the pine region will be closely coordinated with that initiated during the current year in the southern bottomland hardwoods.

(c) Cooperation:

It is probable that cooperation can be obtained from forest land owners, States and other agencies.

(d) Present work:

This is the initial work for the southern pine region.

(2) $20,000 for a survey in the Inland Empire by the Northern Rocky Mountain Forest Experiment Station.

(a) The economic welfare of the Inland Empire, including Idaho, western Montana, and eastern Oregon and Washington, is largely based upon forest industries. This region includes the western white pine forests, which periodically are subjected to disastrous conflagrations and which are now threatened by the blister rust. Overcutting is taking place on private lands. The situation involves complex public and private owner relationships. It presents one of the most puzzling forest problems of the country. The Survey is needed at once to obtain basic data essential for effectively working out public and industrial forest and land policies which will enable perpetuation of the forest resource and the industries based thereon.

(b) The plan of the Department will be:

To obtain authoritative data on the quantity, quality, and distribution of the remaining stands of timber, the rapidity with which it is being cut and destroyed by lumbering, fires, insects, diseases, or other causes, the current rate of replacement by new growth and potential future growth, present and probable future requirements for timber, the acreage and condition of

forest land, and such other data as may be necessary as a basis for State, regional, and national forest policies.

(c) Cooperation:

It is probable that cooperation can be expected from timberland owners and other agencies.

(d) Present work:

This work will initiate the Forest Survey in the Inland Empire.

(3) $14,900 for cooperation in other regions with current undertakings related to the Forest Survey.

(a) There are many closely related land economic inventories or surveys under way or planned by State or other agencies which supplement this nation-wide Survey, and to take full advantage of which it is necessary to cooperate with. Examples are the land economic surveys in the three Lake States, a proposed land economic study in California by the State authorities, and a proposed social-economic investigation in the Southern Appalachian region. Such assignments would somewhat expand the cooperative work commenced this year in the Lake States region and in California, and make possible the initiation of similar efforts in one or more additional regions. It may be necessary in the interest of efficiency and a balanced program to make minor transfers in the allotments indicated above to provide for details of the project such as requirements which are interregional in character.

(b) The plan of the Department will be:

To follow in the Appalachian or other region or regions the plans regarding the collection of the data already indicated, depending upon the amount and character of cooperation that can be obtained and the extent to which Federal cooperation will stimulate other agencies and insure comparability of results with those of the general survey.

(c) Cooperation:

The distribution of this increase is predicated on the character and amount of cooperation that can be obtained.

(d) Present work:

During the current year $8,000 is being used for this cooperative work in the Lake States and $5,000 in California.

Activities Under this Appropriation

The Forest Survey is a comprehensive and detailed appraisal of the nation's present and future requirements for timber, pulp and paper, naval stores, and other forest products, the present and potential growth and the existing volume and quality of timber, and the area and condition of forest land. It is designed to lay a broad foundation of facts as a basis for sound economic forest land use in the United States, and to supply the detailed facts necessary to balance our national timber budget. It is one of the most far-reaching undertakings in the field of forestry. Its value is largely dependent upon the speed with which the entire country is covered. The work is still in its initial stages. It began in the fiscal year 1930 with an appropriation of $40,000, largely in the Pacific Northwest but on a very small scale in the Lake States in cooperation with State organizations. The appropriation for 1931 totals $125,000 and involves an increase in the scale of work in the Pacific Northwest and the initiation of work in the southern bottomland hardwoods. With the appropriations recommended for 1932 the work will be concentrated in the Pacific Northwest, including the adjacent territory of northern Idaho and western Montana, and in the pine and hardwood regions of the South. Work on a very small scale will be under way in cooperation with other agencies in California, the Lake States, and one or more additional regions.

Up to June 30 nearly 5,300,000 acres, exclusive of final office work, had been covered in the Pacific Northwest, including among other things the following: Cruises on about 2,210,000 acres of private lands costing the owners approximately $500,000 had been copied without other cost to the Forest Service; cruises of Oregon and California land grant for 1 million acres copied; a record of the timberland ownership of the entire region obtained on township plats; area of mixed agricultural and forested townships extensively stripped for type and volume, 483,840 acres. The expenditures of Michigan, Minnesota, and Wisconsin on land economic surveys now being conducted in cooperation with the Forest Survey will total $70,000 for the current fiscal year. Approximately 2,650,000 acres will be added to the 6,700,000 acres previously covered. As a part of a study of current national requirements for forest products a census has been made, in cooperation with the Bureau of the Census and the National Lumber Manufacturers Association, of the lumber and other wood products used in 60 classes of manufacture during the calendar year 1928.

## (p) FOREST ECONOMICS

In accordance with the provisions of the Act approved May 22, 1928 (45 Stat., 699-702), and under the $250,000 maximum authorization of Section 10 for investigations in forest economics:

| | |
|---|---|
| Appropriation, 1931 ..... | $50,000 |
| Budget, 1932 ..... | 75,000 |
| Increase ..... | 25,000 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Forest Economics Investigations: | | | | |
| Southern Forest Experiment Station, headquarters at New Orleans, La. ..... | $22,300 | $22,800 | $22,800 | --- |
| Washington, D. C. ..... | 2,200 | 27,200 | 52,200 | $25,000 |
| Totals ..... | 24,500 | 50,000 | 75,000 | 25,000 |

The increase of $25,000 is needed to develop plans for handling the new public domain.

(a) The new public domain is being created by the abandonment of cut-over forest which is reverting to the public through tax delinquency. The problem is aggravated in some localities by the abandonment of submarginal agricultural land. This study would be directed toward the cut-over land problem, with incidental attention as necessary to related abandoned farm land. In such regions as the Lake States and the South, cut-over forest lands are finding little market for agricultural development, and are contributing to the magnitude of the tax delinquency problem. In the three Lake States nearly 13,000,000 acres were tax delinquent in 1926.

Some of this land goes back to counties, some to States, and some to the Federal Government. It is reverting in a bankrupt status and can neither pay taxes nor without organized management recompense the public in some degree for the public debts accumulated thereon. For the most part there is no adequate plan for handling it. It is upsetting local political organization, and undermining the economic foundation of communities and regions. It far exceeds in magnitude the present conceptions of public acquisition programs for forest purposes.

(b) The plan of the Department will be:

To make a study of the economic factors and relationships which affect: (1) the trends of reversion in different regions, as a basis for estimating the area that may come into public ownership; (2) the desirability of utilizing this land for forest production; (3) the desirable line between Federal, State, or local public ownership; and (4) the formulation of plans for the handling and use of these lands, especially in relation to the prosperity of local industries and communities.

While the work may be handled from Washington, major emphasis will be placed at the outset on at least the Lake States and the South, where the situation seems to be most critical.

(c) Present work:

No work is being done on this problem at the present time.

## Activities under this Appropriation.

This appropriation includes work in the field of forest economics other than that which is specifically provided for elsewhere. This excludes work on the Forest Survey, which is provided for under Section 9 of the McSweeney-McNary Act, and Forest Insurance and Forest Taxation provided for by the Clarke-McNary Act.

Studies of the cost and returns from forestry were initiated under this appropriation in the fiscal year 1930. They are being conducted by the Southern Forest Experiment Station. Studies have been made and preliminary reports have been prepared for three representative counties in Mississippi, Georgia, and Alabama, and field work has been completed in several additional counties. The work has brought out very clearly the important part that the farm woodland can play in stabilizing the income of owners and of rural communities in times of agricultural depression. This is especially evident at this time in the naval stores belt of southeastern Georgia. The work also indicates definitely that a large portion of the land in the Southeastern States which is not needed for agriculture can be profitably used to produce crops of timber and naval stores. It is also shown that farmers in particular could increase their incomes considerably by paying more attention to methods of handling their woodland and marketing the timber. A staff is being organized and work is being initiated on a study of ways and means of stimulating the wider practice of forestry by private owners under an appropriation which became available during the current fiscal year. The work will involve a survey of private forestry in various regions and in the United States as a whole, and of factors and conditions responsible for forest devastation as well as those hindering or favoring commercial forest management.

Explanation of Change in Language. It is recommended that the language in the last paragraph of Salaries and General Expenses appropriation be amended to read as follows:

"In all, salaries and general expenses, $_____; and in addition thereto there are hereby appropriated all moneys received as contributions toward cooperative work under the provisions of Section 1 of the Act approved March 3, 1925 (U.S.C., title 16, sec. 572) which funds shall be covered into the Treasury and constitute a part of the special funds provided by the Act of June 30, 1914 (U.S.C., title 16, sec. 498): Provided, that not to exceed $_____ may be expended for departmental personal services in the District of Columbia: Provided further, That not to exceed $1,000 may be expended for the contribution of the United States to the cost of the office of the secretariat of the International Union of Forest Research Stations."

This new language is recommended to enable the Forest Service to cooperate directly with the Union by contributing towards its expenses. The Union was first organized in 1878 as the German Union of Forest Experiment Stations and has since been enlarged, first to include all European nations and now to include all nations. It has further been enlarged so that it includes not only work in forest management, but research in forest products, grazing, and economics, and includes not only governmental institutions but private ones as well. Meetings have been held at irregular intervals, the last one being held in 1929. The United States was represented at the last meeting by three observers. The Union has succeeded in furthering forest research upon problems of international scope, such as studies of the influence of forests on climate. It also has stimulated the exchange of tree seed of known origin so that the climatic races of trees best suited for different localities can be determined. It has fostered standardized methods and technique so that results in the various countries may be comparable. It has encouraged the development of bibliographies on forestry and is establishing a library service so that the most up-to-date information may be made readily available to all parties concerned. Work can be carried on only through intimate international cooperation requiring the maintenance of a permanent headquarters and secretary.

Forest research in the United States is younger than in most other countries and the benefits through active membership and participation are probably greater than those that will accrue to any other nation. The International Union of Forest Research Stations is non-political in character, the decisions are not binding but are recommendations to the various countries, and adequate representation is assured. In order that the United States may be represented and receive full benefits the change of language is requested.

A similar clause was added to the agricultural appropriation bill for the fiscal year 1930 to enable the Department of Agriculture, through the Weather Bureau, to contribute toward the expenses of the International Meteorological Committee, a somewhat similar organization.

## (q) FOREST FIRE COOPERATION

| | |
|---|---|
| Appropriation, 1931 ..... | $1,700,000 |
| Brookhart Act Adjustments ... | 200 |
| Total, 1931 ..... | $1,700,200 |
| Budget, 1932 ..... | 1,775,000 |
| Increase ..... | $ 74,800 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Taxation Inquiry and timber insurance ..... | $ 62,825 | $ 80,200 | $ 80,200 | ... |
| Cooperation with States in forest fire prevention and suppression .. | 1,335,675 | 1,620,000 | 1,694,800 | $74,800 |
| Totals | $1,398,500 | $1,700,200 | $1,775,000 | $74,800 |

The increase of $74,800 is needed to provide more adequate protection from fire on State and private forest lands in response to the insistent need as shown by actual expansion and development of the cooperative projects under Sections 1-3 of the Clarke-McNary Act.

The amount of the total maximum authorization of the Act, $2,500,000, was determined on the basis of 25 to 75 per cent sharing by the Federal Government on the one hand, and States and private owners on the other, in the job of forest fire protection the cost of which, when adequately done, was estimated to be $10,000,000. (Revised estimates place this cost at $13,367,500.) However, the act provides that the amount expended by the Federal Government during any fiscal year may be equivalent to, but not in excess of the amount expended by any State including expenditures by private owners during the same period. A total of $6,032,811 is budgeted by all agencies on these special fire cooperation projects for the fiscal year 1931. Of this sum $4,500,911 is State and private money and $1,531,000 Federal money, the latter being 25 per cent of the total.

In the administration of this cooperative work, the Secretary of Agriculture has formulated and followed the policy of making so-called regular allotments to all cooperating States, the amount of which is in each case limited to a certain percentage of the estimated cost of protection, 9 per cent being the figure used for the present fiscal year. These sums are made available to the States as minimum allowances with the provision that they spend at least equal amounts of State and private funds. In addition to these regular allotments extra allotments are made in accordance with the extent to which States may exceed in their expenditures the amounts of their regular allotments. The reason for following this plan is in order that the two factors of need and performance may each be recognized. Need is recognized in the regular allotments and performance in the extra allotments. The results of cooperation on a 50-50 basis with States just beginning to develop their

program have been striking. The increase proposed will enable the Federal Government to meet approximately 25 per cent of the total expenditures made on the work, although it will not provide for 25 per cent of the expenditures in the case of each State and at the same time guarantee to all States the minimum regular allotment as defined above.

(Note: For State Summary see next page).

Effect of Increase of $74,800 in Federal Appropriation
F.Y. 1932 for Forest Fire Cooperation under Sec. 2
of the Clarke-McNary Law

| State | Estimated cost to protect State & private forest land | Funds budgeted for protection F.Y. 1931 all sources | Federal Allotments F.Y. 1931 | Distribution of increase proposed for F.Y. 1932 | Indicated total Federal allotments F.Y. 1932 |
|---|---|---|---|---|---|
| Maine | $ 342,000 | $ 325,554 | $ 52,265 | $ 3,612 | $ 55,877 |
| N. H. | 131,000 | 74,564 | 16,852 | 736 | 17,588 |
| Vt. | 57,000 | 20,544 | 7,694 | 153 | 7,847 |
| Mass. | 169,000 | 149,127 | 28,627 | 2,411 | 31,038 |
| R. I. | 17,000 | 11,947 | 2,167 | 117 | 2,284 |
| Conn. | 76,000 | 75,108 | 12,333 | 1,010 | 13,343 |
| N. Y. | 378,000 | 307,931 | 66,885 | 6,041 | 72,926 |
| N. J. | 128,000 | 125,570 | 19,712 | 1,273 | 20,985 |
| Pa. | 364,000 | 279,020 | 49,351 | 2,899 | 52,250 |
| Del. | 12,000 | 3,435 | 1,080 | - | 1,080 |
| Md. | 73,000 | 50,460 | 9,929 | 566 | 10,495 |
| Va. | 397,000 | 93,965 | 35,730 | - | 35,730 |
| W.Va. | 312,000 | 104,169 | 32,864 | 879 | 33,743 |
| N. C. | 632,000 | 148,540 | 56,880 | - | 56,880 |
| S. C. | 378,000 | 76,845 | 34,020 | - | 34,020 |
| Ga. | 775,000 | 164,897 | 69,750 | - | 69,750 |
| Fla. | 847,000 | 165,689 | 76,230 | - | 76,230 |
| Ala. | 573,000 | 106,418 | 51,570 | - | 51,570 |
| Miss. | 563,000 | 84,708 | 42,354 | - | 42,354 |
| La. | 434,000 | 150,664 | 47,356 | 1,523 | 48,879 |
| Texas | 434,000 | 98,060 | 39,585 | 96 | 39,681 |
| Okla. | 165,000 | 35,964 | 15,605 | 139 | 15,744 |
| Ark. | 484,000 | | | | |
| Ohio | 60,000 | 25,007 | 6,982 | 291 | 7,273 |
| Ind. | 84,000 | 8,000 | 4,000 | - | 4,000 |
| Ill. | 77,000 | 28,560 | 6,930 | - | 6,930 |
| Ky. | 212,000 | 34,160 | 17,080 | - | 17,080 |
| Tenn. | 245,000 | 49,309 | 23,619 | 143 | 23,762 |
| Mo. | 347,000 | | | | |
| Mont. | 190,000 | 105,001 | 25,879 | 1,502 | 27,381 |
| Ida.(N) | 420,000 | 345,110 | 58,199 | 3,750 | 61,949 |
| S. D. | 4,500 | 5,122 | 1,125 | - | 1,125 |
| N. Mex. | 26,000 | 7,141 | 2,479 | 26 | 2,505 |
| Ida.(S) | 27,000 | 19,900 | 4,900 | 408 | 5,308 |
| Calif. | 969,000 | 791,938 | 147,715 | 11,122 | 158,837 |
| Wash. | 632,000 | 476,407 | 92,080 | 6,470 | 98,550 |
| Ore. | 584,000 | 427,488 | 99,045 | 8,545 | 107,590 |
| Mich. | 662,000 | 513,140 | 127,620 | 12,507 | 140,127 |
| Wisc. | 390,000 | 195,118 | 45,433 | 1,900 | 47,333 |
| Minn. | 697,000 | 348,360 | 99,075 | 6,681 | 105,756 |
| Total | $13,367,500 | $6,032,940 | $1,531,000 | $74,800 | $1,605,800 |
| | | (Contingent including Arkansas | | | 1,000 |
| | Other items .... | (Administration and inspection | | | 88,000 |
| | | (Forest Taxation Inquiry | | | 70,200 |
| | | (Forest Insurance Project | | | 10,000 |
| | | Total appropriation indicated . . . . . | | | $1,775,000 |

## Activities Under This Appropriation

### Cooperation with States in forest fire prevention and suppression

In the fiscal year 1931, the Federal Government is assisting 38 States to prevent and suppress forest fires within their boundaries. The administration of this activity is handled in each State by the State Forestry Department; the Federal Government provides a proportion of necessary funds and brings to the States for their consideration and aid the composite experience and knowledge gained through nation wide contact with the forest fire problem. The experience of the individual States and of the Federal Government on the National Forests is made available to all of the States. This is accomplished by a field personnel of District Forest Inspectors located at Amherst, Massachusetts; Washington, D. C.; Asheville, N. C.; New Orleans, Louisiana; and Louisville, Kentucky; and through the Regional Forest District headquarters in the Lake States and in the West.

The Washington office is kept informed of this activity by plans, budgets, and reports submitted by the cooperating States. The plans and budgets are carefully considered and must have the joint approval of the Federal Government and the States before they are put into effect. The expenditures reported by the States are the basis for the receipt by the States of their share of the Federal appropriation. A careful checking of the bookkeeping records of each cooperating State is one of the tasks of each District Forest Inspector.

During the calendar year 1929, 44,076 fires were handled by the State organizations. These burned over an area of 3,632,000 acres of forest land and 1,244,000 acres of other land. In view of the fact that the summer of 1929 was very hot and the woods in a very inflammable condition, this record was an exceedingly creditable one. There is a large area of forest land which is not yet given any systematic protection. The latest figures indicate that this is about 191,000,000 acres. Fires on these lands often burn unchecked. As far as could be determined the number of fires in 1929 on this area was about 91,000 and the area burned 41,354,000 acres. It is toward this land that the efforts of the State organizations must be more and more directed. Federal funds will, of course, assist in giving this land its needed protection.

Progress in cooperative forest fire protection is roughly indicated by the following expenditures:

| | Year 1911 | Year 1929 |
|---|---|---|
| Total cooperative expenditures | $ 257,000 | $5,841,000 |
| State and private expenditures | 220,000 | 4,633,000 |
| Federal expenditures | 37,000 | 1,208,000 |
| Number of States cooperating | 11 | 38 |
| Area, State and private, protected (acres) | 61,000,000 | 224,000,000 |

Investigations of forest taxation and forest insurance

The purpose of investigations in forest taxation is to establish the fundamental principles upon which forest taxation should be based and to cooperate with States in working out legislation which will conform to these principles, and at the same time be adapted to local requirements. The work involves the collection and analysis of data on such subjects as: The economic and legal background of the entire system of taxation in individual States; the financial structure and existing tax system of States, counties and minor political subdivisions; expenditures for roads, schools and other governmental functions; the practical operation of the taxation system in general, including its effect on different classes of property, assessment practices, etc.; existing State forest tax legislation; the actual effect of existing laws on the use of land for growing timber; methods and results of forest tax legislation in European countries where forestry is well established.

Analysis of the data collected in Minnesota, Wisconsin, Michigan, Washington, Oregon, and New Hampshire was continued and a field study made in three counties of North Carolina. To date the Inquiry has issued 10 Progress Reports, several of which presented some of the results of the work in Minnesota, Oregon, Washington, and New Hampshire. An office analysis was made of the forest tax legislation and conditions in Norway and Sweden, and a large amount of data on forest taxation in Europe was collected for the Inquiry in France, Switzerland, and Germany. A study of the results of existing forest tax legislation in the United States was initiated. Much of the effort of the Inquiry during the coming year will be devoted to the preparation of a report which will present the results of its investigations in a more comprehensive way than has hitherto been possible.

The purpose of forest insurance investigations is to determine under what conditions in the United States forest insurance is now feasible and to work out a satisfactory basis and form for such insurance. The work consists of the collection, where not already available, and analysis of such data as: Statistics of forest fires, including information as to causes, location, seasons, weather conditions, condition of the forest cover, etc.; Appraisal of the damage caused by fire in the different types of forest, under different conditions; Ratios of loss to values at stake, as a basis for insurance rating schedules.

The past year was devoted largely to an exploratory study of the literature and experience dealing with forest insurance in the United States and in foreign countries, and in establishing advisory and cooperative contacts and preparing plans for the more intensive phase of the work. This has now been started in Washington and Oregon, in which region a great deal of interest has been shown in the problem. It is planned to continue the study in this region during the coming year.

## (r) COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK

| | |
|---|---|
| Appropriation, 1931 | $93,000 |
| Budget, 1932 | 95,000 |
| Increase | $ 2,000 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Cooperation with States in the procurement, production, and distribution of forest tree seeds and plants in establishing windbreaks, shelter belts, and farm woodlots upon denuded or nonforested lands | $ 82,950 | $ 93,000 | $ 95,000 | $ 2,000 |

The increase of $2,000 is for cooperation with States in the procurement, production and distribution of forest tree seeds and plants in establishing windbreaks, shelterbelts, and farm woodlots upon denuded or nonforested lands: Under Section 4 of the Clarke-McNary law the Federal Government is now cooperating with 39 States and with Porto Rico and Hawaii in the growing and distribution of forest trees to farmers at a reasonable cost. It is anticipated that this number will be increased to 45 by 1932. In order to provide for new States under the present plan of alloting $2,000 to each State and with $5,000 for administration, an appropriation of $95,000 will be needed.

### Activities Under This Appropriation

Partly due at least to the stimulation afforded by Federal funds, the cooperating States distributed 25 million trees to farmers during the calendar year 1929, sufficient for planting 25,000 acres of land. These trees are furnished to farmers at a reasonable cost. Their planting represents direct action aimed at the profitable utilization of farm lands which are submarginal for agricultural use. In these projects, just as in the fire cooperation projects, the work is administered directly by the State agencies; the Forest Service inspects, advises, and correlates. During the calendar year 1929 the Federal Government expended $72,417 in this project and the States $305,325, a total for both agencies of $377,742. Since the termination of the calendar year 1929, the States of Mississippi and Utah have entered into a cooperative project of this kind with the Federal Government. In addition to the distribution of trees to farmers, the States involved are carrying on a much wider distribution to others than farmers for the reforestation of forest land. During 1929 the total distribution of such trees by States was 67,722,000.

For State summary, see next page.

FUNDS BUDGETED BY STATES AND TERRITORIES FOR
COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK TO FARMERS
UNDER SEC. 4, CLARKE-MCNARY LAW, FISCAL YEAR 1931

| State | Total State Funds | State funds devoted to project | % Total output to farmers | Federal allotment | Total |
|---|---|---|---|---|---|
| Maine | $ 1,500.00 | $ 1,500.00 | 100 | $ 1,500 | $ 3,000.00 |
| New Hampshire | 15,372.46 | 6,686.23 | 50 | 2,000 | 8,686.23 |
| Vermont | 15,900.00 | 6,950.00 | 50 | 2,000 | 8,950.00 |
| Massachusetts | 38,000.00 | 8,000.00 | 25 | 2,000 | 10,000.00 |
| Connecticut | 7,000.00 | 2,000.00 | 45 | 2,000 | 4,000.00 |
| New York | 267,364.00 | 51,872.80 | 20 | 2,000 | 53,872.80 |
| New Jersey | 17,621.00 | 11,734.70 | 70 | 2,000 | 13,734.70 |
| Pennsylvania | 42,310.00 | 20,155.00 | 50 | 2,000 | 22,155.00 |
| Delaware | 4,355.00 | 2,117.75 | 65 | 2,000 | 4,117.75 |
| Maryland | 7,875.00 | 2,937.50 | 50 | 2,000 | 4,937.50 |
| Virginia | 4,303.00 | 3,546.64 | 88 | 2,000 | 5,546.64 |
| North Carolina | 9,714.00 | 3,857.00 | 50 | 2,000 | 5,857.00 |
| South Carolina | 5,532.00 | 2,519.20 | 60 | 2,000 | 4,519.20 |
| Georgia | 2,000.00 | 2,000.00 | 100 | 2,000 | 4,000.00 |
| Florida | 3,050.00 | 2,040.00 | 80 | 2,000 | 4,040.00 |
| Alabama | 3,000.00 | 2,000.00 | 80 | 2,000 | 4,000.00 |
| Mississippi | 1,500.00 | 1,500.00 | 100 | 1,500 | 3,000.00 |
| Louisiana | 15,049.00 | 4,819.60 | 40 | 2,000 | 6,819.60 |
| Oklahoma | 3,250.00 | 3,250.00 | 100 | 2,000 | 5,250.00 |
| Ohio | 19,500.00 | 8,750.00 | 50 | 2,000 | 10,750.00 |
| Indiana | 16,350.00 | 8,643.00 | 58 | 2,000 | 10,643.00 |
| Iowa | 3,000.00 | 2,000.00 | 80 | 2,000 | 4,000.00 |
| Kentucky | 7,000.00 | 2,666.66 | 66.6 | 2,000 | 4,666.66 |
| Tennessee | 5,300.00 | 5,300.00 | 100 | 2,000 | 7,300.00 |
| Missouri | 2,000.00 | 2,000.00 | 100 | 2,000 | 4,000.00 |
| Porto Rico | 11,500.00 | 7,450.00 | 70 | 2,000 | 9,450.00 |
| Montana | 4,624.02 | 4,624.02 | 100 | 2,000 | 6,624.02 |
| Idaho | 990.00 | 990.00 | 100 | 900 | 1,890.00 |
| North Dakota | 8,163.33 | 5,622.50 | 75 | 2,000 | 7,622.50 |
| Nebraska | 10,550.00 | 10,550.00 | 100 | 2,000 | 12,550.00 |
| Kansas | 7,825.00 | 2,912.50 | 50 | 2,000 | 4,912.50 |
| Colorado | 2,355.00 | 2,355.00 | 100 | 2,000 | 4,355.00 |
| Wyoming | 1,570.00 | 1,570.00 | 100 | 1,570 | 3,140.00 |
| Utah | 1,300.00 | 1,300.00 | 100 | 1,300 | 2,600.00 |
| California | 10,713.75 | 763.65 | 12 | 762 | 1,525.65 |
| Hawaii | 48,660.00 | 24,343.20 | 52 | 2,000 | 26,343.20 |
| Washington | 4,125.00 | 2,287.50 | 70 | 2,000 | 4,287.50 |
| Oregon | 2,000.00 | 2,000.00 | 100 | 2,000 | 4,000.00 |
| Michigan | 7,867.00 | 5,893.60 | 80 | 2,000 | 7,893.60 |
| Wisconsin | 9,900.00 | 1,785.00 | 30 | 1,785 | 3,570.00 |
| Totals | $ 649,988.56 | $ 243,293.05 | | $ 75,317 | $ 318,610.05 |

| | |
|---|---|
| Administration | $ 3,990 |
| Contingent for allotments to new States | 13,693 |
| Total appropriation | $ 93,000 |

## (s) ACQUISITION OF ADDITIONAL FOREST LANDS

| | |
|---|---|
| Appropriation, 1931 | $2,000,000 |
| Budget, 1932 | 2,000,000 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Examination and purchase of additional forest lands at headwaters of navigable streams | $2,000,000 | $2,000,000 | $2,000,000 |

### Activities Under This Appropriation

1. Determination by the Forest Service and the Geological Survey of the acres meeting the provisions of the applicable laws.
2. Establishment of local organizations to conduct purchase work.
3. Determination of land ownerships, values, etc.
4. Receipt of proposals of sale; examination, cruise and appraisal of lands, preparation of reports.
5. Presentation of cases for consideration of National Forest Reservation Commission.
6. Surveys of lands approved by Commission.
7. Title examinations, preparation of records of title, institution of condemnation proceedings, presentation of cases for approval by Attorney General.
8. Cash payments to vendors for lands vested in United States.

Work now being conducted in the States of Alabama, Arkansas, Florida, Georgia, Louisiana, Kentucky, Maine, Michigan, Minnesota, Mississippi, New Hampshire, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, West Virginia and Wisconsin.

Within the States named 39 Purchase Areas have been authorized by the National Forest Reservation Commission. These contain a gross area of 15,275,574 acres, of which 13,752,097 acres is believed to be chiefly valuable for forest purposes, and suitable for administration as National Forests. Of this area 6,742,231 acres is, or is in process of becoming National Forest land. The lands reserved from the unappropriated public domain, acquired by exchange, or acquired by transfer from other Departments aggregate 2,598,688 acres. The lands purchased or in process of purchase total 4,143,543. The additional lands needed to consolidate the areas in Federal ownership and carry out the purposes of the law total 7,009,866 acres.

## (t) ROOSEVELT MEMORIAL

| | |
|---|---|
| Appropriation, 1931 ..... | $25,000 |
| Budget, 1932 ..... | 0 |
| Decrease | $25,000 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Decrease |
|---|---|---|---|---|
| Roosevelt Memorial Monument on Forest Highway | ---- | $25,000 | ---- | $25,000 |

Construction of this improvement will be completed in the fiscal year 1931.

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## PERMANENT AND INDEFINITE APPROPRIATIONS AND SPECIAL FUNDS

### (u) REFUNDS TO DEPOSITORS, EXCESS OF DEPOSITS, NATIONAL FORESTS FUND

Appropriation, 1931 ..... $75,000
Budget, 1932 ..... 75,000

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Refunds | $96,879 | $75,000 | $75,000 |

All money received, by or on account of the Forest Service for timber, or from any other source of forest-reservation revenue, is covered into the Treasury of the United States as a miscellaneous receipt; and there is appropriated so much as may be necessary to make refunds to depositors of money deposited by them in excess of amounts found actually due from them to the United States, and so much as may be necessary to refund to the rightful claimants such sums as may be found to have been erroneously collected for the use of lands, or for timber or other resources sold from lands located within, but not a part of, the national forests, or for alleged illegal acts done upon such lands, which acts are subsequently found to have been proper and legal.

### (v) NATIONAL FOREST RESERVATION COMMISSION

Appropriation, 1931 .....$500
Budget, 1932 ..... 500

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Expenses of National Forest Reservation Commission and its members ..... | $610 | $500 | $500 |

A sum sufficient to pay the necessary expenses of the commission and its members, not to exceed an annual expenditure of $25,000, has been appropriated, to be paid out on the audit and order of the president of the commission, which audit and order is conclusive and binding upon all departments as to the correctness of the accounts of the commission.

### (w) PAYMENTS TO STATES AND TERRITORIES FROM THE NATIONAL FORESTS FUND

Appropriation, 1931 .....$1,600,000
Budget, 1932 ..... 1,600,000

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Payment of 25% of national forest receipts to States in which national forests are situated | $1,564,640 | $1,677,559 | $1,600,000 |

Twenty-five per cent of all money received from each National Forest during any fiscal year is paid at the end thereof by the Secretary of the Treasury to the State or Territory in which the National Forest is situated, to be expended as the State or Territorial legislature may prescribe for the benefit of the public schools and public roads of the county, or counties in which the national forest is situated. When any National Forest is in more than one State or Territory or county, the distributive share to each from the proceeds of the forest is proportionate to its area therein.

(x) COOPERATIVE WORK, FOREST SERVICE

Appropriation, 1931 .....$1,700,000
Budget, 1932 ..... 1,700,000

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Construction of improvements, | $1,134,909 | $1,134,949 | $1,134,949 |
| Maintenance of improvements, | 65,000 | 65,000 | 65,000 |
| Prevention and suppression of forest fires, | 280,000 | 239,551 | 239,551 |
| Disposal of brush and other debris in timber sale operations | 172,000 | 162,000 | 162,000 |
| Forest investigations, | 61,500 | 82,000 | 82,000 |
| Refunds to cooperators | 16,500 | 16,500 | 16,500 |
| Totals | $1,729,909 | $1,700,000 | $1,700,000 |

All moneys received as contributions toward cooperative work in forest investigations, or the protection and improvement of the national forests, including deposits received from timber purchasers to cover the cost to the United States of disposing of brush and other debris resulting from cutting operations in sales of national forest timber, are covered into the Treasury of the United States and constitute a special fund, which is appropriated and made available until expended as the Secretary of Agriculture may direct, for the payment of the expenses of the investigations, protection, or improvements of the Forest Service, and for refunds to the contributors of amounts paid in by them in excess of their share of the cost of investigations, protection, or improvements.

(y) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND NEW MEXICO NATIONAL FORESTS FUND

Appropriation, 1931 .....$40,000
Budget, 1932 ..... 40,000

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Payments to the common school funds of Arizona and New Mexico on account of receipts from State lands administered as parts of National Forests, | $41,243 | $41,316 | $40,000 |

At the close of each fiscal year there is paid by the Secretary of the Treasury to each of these two States, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within the State as the area of lands granted to the State for school purposes within these forest reserves may bear to the total area of all national forests within these States.

(z) ROADS AND TRAILS FOR STATES, NATIONAL FORESTS FUND

Appropriation, 1931 .....$600,000
Budget, 1932 ..... 600,000

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Construction and maintenance of roads and trails within the National Forests, | $503,094 | $600,000 | $600,000 |

The amount available for expenditure under this item as determined by the total receipts from the National Forests in the preceding year, since it represents 10 per cent of the receipts. Present estimates indicate that receipts from the National Forests in the fiscal year 1931 will be in the neighborhood of $6,400,000. However, the funds are not made available by the General Accounting Office until several months of the fiscal year have passed, so that expenditures from the appropriation are usually slightly less than the amount made available by appropriations.

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Note:- Also see Miscellaneous Section for "Forest Roads and Trails", and "Soil Erosion Investigations."

## BUREAU OF CHEMISTRY AND SOILS

### (a) GENERAL ADMINISTRATION

| | |
|---|---|
| Appropriation, 1931 ..... | $ 58,540 |
| Brookhart Act adjustments ..... | 520 |
| Total, 1931 ..... | 59,060 |
| Budget, 1932 ..... | 59,815 |
| Increase ..... | 755 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| General Administration ..... | $61,888 | $59,060 | $59,815 | $755 |

The increase of $755 is for under-average salary grade adjustments.

Activities under Appropriation for General Administration

This appropriation provides for the salaries and expenses of the Office of the Chief of Bureau and the business organization units such as Accounting, Personnel, Supplies, etc. It is for the purpose of maintaining general administration and control of the Bureau.

### (b) AGRICULTURAL INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931 ..... | $340,000 |
| Allotment, Special Corn Borer Appropriation ..... | 12,000* |
| Brookhart Act adjustments ..... | 1,969 |
| Total, 1931 ..... | 353,969 |
| Budget, 1932 ..... | 370,150 |
| Increase ..... | 16,181 |

* Transfer to this appropriation proposed in Budget, 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increases |
|---|---|---|---|---|
| Carbohydrates ..... | $ 43,650 | $ 44,710 | $ 49,710 | $ 5,000 (1) |
| Crop Chemistry ..... | 16,900 | 17,578 | 17,578 | |
| Food research ..... | 73,500 | 101,539 | 101,539 | |
| Fruit & vegetable by-products ..... | 42,100 | 50,391 | 55,572 | 5,181 (2) |
| Industrial farm products ..... | 54,100 | 70,907 | 76,907 | 6,000 (3) |
| Lignin research ..... | 10,750 | 14,855 | 14,855 | |
| Oil, fat, and wax ..... | 18,100 | 18,515 | 18,515 | |
| Protein and nutrition .. | 35,220 | 35,474 | 35,474 | |
| Totals ..... | $294,320 | $353,969 | $370,150 | $16,181 |

The increase of $16,181 is submitted for the following purposes:

(1) $5,000 to study the chemical and enzymic deterioration of sugar cane under various climatic conditions such as freezing, etc., which during the 1929 season caused a loss of one-fourth to one-third of the entire crop in Louisiana.

(a) There is known to be a progressive deterioration of cane due to the above conditions. The relative difference in deterioration, however, under different methods of handling is not known. It is proposed to make a careful study of the deterioration due to climatic conditions upon (a) standing cane, (b) cane cut but not windrowed, (c) windrowed cane, and (d) cane stored under various other conditions, to the end that the best procedure of handling cane may be ascertained and these losses minimized.

(b) The plan of the Department will be:

To endeavor to develop efficient and satisfactory methods of handling damaged cane and thereby minimizing loss in the recovery of sugar from the juice.

(c) Present work:

No work is being done at the present time.

(2) $5,181 to expand the fruit and vegetable by-product investigational work of the Bureau.

(a) Utilization of fruit juices offers one of the most promising means

of disposing of surplus and cull fruit products. The demand for such juices has increased tremendously due to our increased knowledge of their dietary importance and also to the convenience of their use by the consuming public. The expansion of the use of fruit juices depends upon the application of better methods of pasteurization, freezing and canning to the problems for preservation for future use. The fruit production in the United States has an annual value of $1,000,000,000, and the losses vary from 10% to 50% or more.

(b) The plan of the Department will be:

To study the application of pasteurization, freezing and canning to the preservation of fruit juices, thereby minimizing losses which reach very large proportions.

(c) Cooperation:

We are cooperating very closely with industries interested and with producers. This problem is of special interest to the citrus fruit growing states of the south and west, to the apple industry scattered throughout the United States and to other fruit, berry and vegetable industries. Cooperation with the Bureau of Plant Industry is contemplated. Cooperation also will be carried on with the National Canners Association.

(d) Present work:

A very limited amount of preliminary work of a survey character is now being done.

(3) $6,000 for tanning materials investigations:

(a) It is estimated that within a few years this country will be able to supply only a fractional part of the tanning material required annually, if something is not done to develop other tannin-bearing materials not now available commercially. The inroads of man and disease upon forests have reduced the supply, and the situation is becoming more acute each year, particularly as the result of the rapid extinction by blight of the native chestnut tree. A survey of possible unused domestic sources of tannin and cooperation with the Bureau of Plant Industry in the development of large scale experimental crops of promising foreign tannin-bearing plants with a view to developing other sources, is imperative. Research is required to develop practicable and profitable means of utilizing the constituents of these plants for making not only tanning materials but perhaps starches, sugars, alcohols, or other solvents, and cellulose products such as paper and board, and thus make available as farm crops and industrial raw materials, plants that are otherwise useless or a nuisance.

(b) The plan of the Department will be:

Promising tannin-bearing plants of domestic and foreign origin will

be investigated for their tannin content and methods of recovery of tannin will be studied along with other constituents which may have commercial values as by-products.

(c) Cooperation:

The Bureau of Plant Industry will furnish and propagate such materials as seem to have commercial possibilities.

(d) Present work:

A comparatively small amount of preliminary work of a survey character is now being carried on. A number of samples of foreign and domestic material have been analyzed.

Activities under Appropriation for Agricultural Investigations

The activities under this appropriation are confined to the chemical and biological investigation of foods and substances used in the manufacture thereof, and of agricultural products used for other purposes. They include fundamental investigations aimed at better preparation and utilization of known commercial products and of developing new products having commercial value. These investigations also include physiological effects of those products used for foods on the human organism. Active cooperation with associations and scientific societies is maintained in developing methods of analysis which will be more accurate and more uniform.

## (c) COLOR INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 88,000 |
| Brookhart Act adjustments ..... | 460 |
| Total, 1931 ..... | 88,460 |
| Budget, 1932 ..... | 94,340 |
| Increase ..... | 5,880 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increases W.F. | Increases U.A.S. |
|---|---|---|---|---|---|
| Color & Fermentation Invs..... | $ 77,496 | $ 88,460 | $ 94,340 | $5,000 | $880 |

The increase of $5,880 is submitted for the following purposes:

$880 under-average salary grade adjustments.

$5,000 for Industrial-Fermentation Studies.

(a) The fermentation industry is now producing annually products not used for food valued at $122,000,000, using among other materials about 19 millions of bushels of corn for the production of butanol alone. The possibilities of further increasing the use of farm products and by-products by industries through the fermentation processes for the manufacture of chemicals is exceedingly encouraging.

(b) The plan of the Department will be:

To investigate the action of certain molds upon sugar cane, xylose, glucose, corn starch, etc., to produce chemicals which are now produced by other and in many cases more costly methods. The ultimate aim of this investigation is to produce chemicals such as tartaric acid, citric acid, etc. which are now largely imported.

(c) Present work:

Fundamental research on micro-organisms, the production of which are of industrial value.

## Activities under Appropriation for Color Investigations

Activities under this appropriation are confined to investigations and experiments in the utilization of materials produced in the United States in the manufacture of dyes and medicines, and for industrial purposes, and when found advisable, in cooperation with individuals, associations and corporations.

### (d) SIRUP & SUGAR INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 37,600 |
| Brookhart Act adjustments .... | 100 |
| Total, 1931 ..... | 37,700 |
| Budget, 1932 ..... | 37,975 |
| Increase ..... | 275 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| Sirup & Sugar Investigations ..... | $ 36,875 | $ 37,700 | $ 37,975 | $ 275 |

The increase of $275 is for under-average salary grade adjustments.

Activities under Appropriation for Sirup & Sugar Investigations

The investigational work conducted under this appropriation has as its object the development of more efficient methods for the manufacture of table sirups and sugar and of sweet sirups. It includes studies having for their object increased yields and improved quality of beet and cane sugars; also chemical and physical studies of maple products. Methods used in the manufacture of corn sirup, cane sugar, sorghum, etc., will be investigated with a view to improving our analytical methods.

## (e) INSECTICIDES & FUNGICIDES INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 100,000 |
| Allotment, Special Corn Borer Appropriation . | 18,000* |
| Brookhart Act adjustments ..... | 406 |
| Total, 1931 ..... | 118,406 |
| Budget, 1932 ..... | 129,200 |
| Increase ..... | 10,794 |

*Transfer to this appropriation proposed in Budget, 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increases W.F. | Increases U.A.S. |
|---|---|---|---|---|---|
| Organic Insecticides & Fungicides ..... | $ 60,115 | $ 76,000 | $ 81,500 | $ 5,000(1) | $500 |
| Inorganic Insecticides & Fungicides ..... | 39,950 | 42,406 | 47,700 | 4,994(2) | 300 |
| Totals ..... | $100,065 | $118,406 | $129,200 | $ 9,994 | $800 |

The increase of $10,794 is submitted for the following purposes:

$800 under-average salary grade adjustments.

$9,994 increase in working funds, as follows:

(1) $5,000 for Synthetic Organic Insecticides & Fungicides Investigations

(a) This increase is for the purpose of expanding and speeding up the work now being carried on which has special reference to the control of the perennial canker, a disease which threatens the destruction of certain orchards in the apple growing sections of Hood River, Oregon, and Wenatchee, Washington. Losses have already amounted to thousands of dollars annually, and if spread into other sections may bring disaster to the apple growing industry of the west.

(b) The plan of the Department will be:

Research work will be carried on in the laboratory to develop new organic insecticides which will be tested out in the field. The organic salts of copper, zinc and mercury will be investigated first, as salts of these metals which have been tested in a preliminary way give encouraging results.

(c) Cooperation:

This work will be carried on in cooperation with the Bureau of Plant Industry and with apple growers throughout the section where the perennial canker is prevalent.

(d) Present work:

We are now synthesizing organo-metallic compounds, especially those containing mercury, copper, zinc and fluorine. These compounds are being tested by several offices in the Bureau of Plant Industry to determine the value and control of the fungus pests referred to above. They are being tried out against the perennial canker in the northwest. An increase of $5,235 was allowed in the 1931 bill for this work.

(2) $4,994 for Inorganic Insecticides & Fungicides (Fumigants)

(a) The Bureau has been urgently requested by the Bureau of Entomology, to provide an increased personnel to work with Entomologists at Whittier, Calif. on the fumigation problems of the citrus fruit industry. At the present time we have one chemist aiding in this work and the entomologists are retarded because of lack of fundamental chemical information. Most of the California fruit is fumigated with hydrocyanic gas to kill scale insects. The gas is very poisonous to human beings and the human hazard is very great. The investigation contemplates a substitute for this gas.

This increase is for the purpose of providing the needed assistance.

(b) The plan of the Department will be:

To study the physical and chemical properties of hydrocyanic acid gas and their relation to the effective killing of scale insects. To develop substitutes for hydrocyanic acid gas in the fumigation of scale insects.

(c) Cooperation:

Cooperation with the Bureau of Entomology as outlined above.

(d) Present work:

This work was only recently started and a preliminary survey is now being made. An increase of $7,000 was allowed in the 1931 bill for this work.

Activities under Appropriation for Insecticides & Fungicides Invs.

The object of these investigations is to develop better methods for the manufacture of known insecticides, fungicides, and fumigants, and for the preparation of new compounds and materials having insecticidal and fungicidal properties, and a study of the chemical problems relating to the application of these materials.

Under the increase of $35,000 allowed in the 1930 Bill for insecticides and fungicides investigations, $25,000 was for the purpose of developing new insecticides not poisonous to man and $10,000 for the study of spray residues. The constituents of derris root, which appear to be toxic to insects and to certain other low forms of life, but not to any appreciable extent to high forms, have been studied. A white crystalline material, known as rotenone, one of the most toxic bodies on insects and lower organisms, as well as several other compounds, have been extracted from derris root. Work is now being prosecuted upon the structure of the rotenone molecule with the hope that a method of synthesizing it may be developed. A synthetic rotenone must be produced if a substitute for lead arsenate and other arsenates is desired as the natural product is too expensive to be used as a substitute. Organo-metallic compounds, especially those containing mercury, copper and fluorine, which have promising properties in controlling various pests have been prepared. A new chemical compound "neonicotine" having a toxicity equal to, if not superior to nicotine, has been prepared from pyridine. This new compound gives promise of cheapening the cost of production of this insecticide.

(f) DUST EXPLOSIONS & FARM FIRES

| | |
|---|---|
| Appropriation, 1931 ..... | $ 51,500 |
| Brookhart Act adjustments ..... | 200 |
| Total, 1931 ..... | 51,700 |
| Budget, 1932 ..... | 52,285 |
| Increase ..... | 585 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| Dust explosions ..... | $ 35,300 | $ 36,500 | $ 36,900 | $400 |
| Farm fires ..... | 14,900 | 15,200 | 15,385 | 185 |
| Totals ..... | $ 50,200 | $ 51,700 | $ 52,285 | $585 |

The increase of $585 is for under-average salary grade adjustments.

Activities under Appropriation for Dust Explosions & Farm Fires

These investigations include studies to determine the causes and to develop methods of control of explosions of agricultural and industrial dusts; to study the causes of fires on farms, especially fires arising from spontaneous combustion of agricultural products, and to develop methods and equipment for their prevention and control.

(g) NAVAL STORES INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 32,000 |
| Brookhart Act adjustments ..... | 306 |
| Total, 1931 ..... | 32,306 |
| Budget, 1932 ..... | 32,530 |
| Increase ..... | 224 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| Naval Stores Investigations ..... | $ 31,200 | $ 32,306 | $ 32,530 | $ 224 |

The increase of $224 is for under-average salary grade adjustments.

Activities under Appropriation for Naval Stores Investigations

The purpose of these investigations is to investigate and demonstrate improved methods or processes of preparing naval stores and to make fundamental studies of the composition and properties of turpentine and rosin and the production of new compounds from turpentine and rosin having commercial values.

Researches on naval stores are conducted by both the Bureau of Chemistry & Soils and the Forest Service. The Bureau of Chemistry & Soils handles research on distillation, refinement, and uses of commercial products, that is, after the gum is taken from the tree. The Forest Service covers the forest or woods phase of naval stores work up to the time the gum is taken from the tree.

## (h) SOIL CHEMISTRY

| | |
|---|---|
| Appropriation, 1931 ..... | $ 40,000 |
| Brookhart Act adjustments ..... | 260 |
| Total, 1931 ..... | 40,260 |
| Budget, 1932 ..... | 43,170 |
| Increase ..... | 2,910 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increases W.F. | Increases U.A.S. |
|---|---|---|---|---|---|
| Soil Chemistry ..... | $ 35,675 | $ 40,260 | $ 43,170 | $2,500 | $ 410 |

The increase of $2,910 is submitted for the following purposes:

$410 under-average salary grade adjustments.

$2,500 to inaugurate an investigation of the chemical characteristics and the organic colloidal fractions of peat and the organic soil constituents.

(a) During 1929 approximately $740,000 was paid for 45,000 tons of peat imported from Europe. It is estimated that 100,000,000 acres of peat, a greater portion of which is not utilized for any purpose whatsoever, is available in the United States. Preliminary surveys show that we have within the United States almost every variety of peat to be found in Europe. The complete displacement of the city livery stable by the garage has eliminated an important source of organic manure for the greenhouse, the truck farmer and the city gardener. Coincident with this change there has been a steady and significant increase in importance of peat material from Europe. It is believed that our domestic supply of this material deserves an intensive investigation.

(b) The plan of the Department will be:

Samples of peat collected in various sections of the United States by members of the Soil Survey will be subjected to careful chemical investigation to determine the characteristics, the organic colloidal fractions to be studied and the determination of the organic soil constituents present, to the end that information may be at hand looking towards the commercial utilization of peats from domestic sources.

(c) Present work:

Investigations are being made of possible methods for rendering peat and efficient fertilizer. Preliminary investigations are being made on the properties of peat colloids from domestic sources and compared with sources of foreign peats.

Activities under Appropriation for Soil Chemistry

The work of this Division includes the analyses of soil samples, soil colloids and related material for the use of the Soil Survey and for many other divisions and bureaus of the government service, and for intelligent reply to queries from the public.

## (I) SOIL PHYSICS

| | |
|---|---|
| Appropriation, 1931..... | $ 18,100 |
| Brookhart Act adjustments ... | 560 |
| Total, 1931..... | 18,660 |
| Budget, 1932..... | 19,015 |
| Increase..... | 355 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| Soil Physics..... | $17,940 | $18,660 | $19,015 | $355 |

The increase of $355 is for under-average salary grade adjustments.

Activities under Appropriation for Soil Physics

This work consists of making mechanical analysis of soils and soil materials; investigation of the merits of various methods of estimating clay and colloids in soils; development of electrostatic method to enable soil moisture determinations in the field; investigation if microphysical properties of soil, and making application of radiation methods to the study of soil colloids.

## (j) FERTILIZER INVESTIGATIONS

| | |
|---|---|
| Appropriation, 1931..... | $ 345,000 |
| Brookhart Act adjustments..... | 3,260 |
| Total, 1931..... | 348,260 |
| Budget, 1932..... | 378,400 |
| Increase..... | 30,140 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Mechanism of catalysis.. | $34,960 | $35,721 | $35,721 | |
| Transformation of nitrogen compounds..... | 34,740 | 36,137 | 36,137 | |
| Mechanical engineering.. | 46,635 | 48,624 | 48,624 | |
| Chemical engineering.... | 20,100 | 20,438 | 20,438 | |
| Biochemical & organic investigations..... | 28,110 | 28,831 | 28,831 | |
| Physics investigations.. | 33,160 | 33,268 | 38,408 | $5,140 (1) |
| Gas constants and chemical analysis..... | 25,275 | 25,959 | 25,959 | |
| Phosphate and potash investigations..... | 50,250 | 56,053 | 76,053 | 20,000 (2) |
| Concentrated fertilizers | 56,770 | 63,229 | 68,229 | 5,000 (3) |
| Totals..... | $330,000 | $348,260 | $378,400 | $30,140 |

The increase of $30,140 is submitted for the following purposes:

(1) $5,140 for Physics Investigations

(a) This increase is requested to enable the bureau to speed up its work upon x-ray, spectroscopic and photochemical investigations with special reference to the fixation of nitrogen. It is the purpose to study the activities of nitrogen and other fixation possibilities by the use of radiations of different wave lengths, such as ultra-violet, visible, infra-red and electrical excitation.

(b) The plan of the Department will be:

To make x-ray, spectroscopic and photochemical investigations with special reference to the fixation of nitrogen as outlined above.

(c) Present work:

Investigations now carried on are concerned in general with securing fundamental data which may throw light on the reactions occurring in nitrogen fixation and other chemical processes. Studies of the fundamental principles of activation; catalysis and radiation have resulted in contributions that have wide application both in this country and in Europe.

(2) $20,000 for Phosphate and Potash Investigations

(a) This increase is for the purpose of expanding to pilot plant proportions, investigations now conducted on a laboratory scale, of production of phosphorus by blast furnace methods.

(b) The plan of the Department will be:

Studies will be made of the reactions involved in the blast furnace method of producing phosphorus, economies as may be practiced both in the raw materials used, methods of running the furnace and the products produced.

(d) Present work:

The Bureau has been investigating the blast furnace method for the production of phosphorus and potash upon laboratory scale. Very important results have been obtained and the opportunities for utilization of the domestic sources of raw materials in fertilizer production are very great. The newly constructed fuel-fired furnaces will be operated experimentally in the production of liquid phosphoric acid from phosphate rock by volatilization and also in the extraction of potash by volatilization from refractory native ores. The purpose is to develop fuel-fired furnaces as an instrument for the production of better phosphate fertilizers, and as a producer, from domestic materials, of the potash which is being imported to meet agricultural demands.

(3) $5,000 for Concentrated Fertilizer Investigations

(a) Research on the properties of fertilizers which relate particularly to their capacity for storage and mechanical distribution in the field should be made. The uniformity with which a fertilizer can be distributed in the field and its placement with respect to the seed have a decided influence on the germination, growth and yield of crops. Non-uniformity of distribution may be due to imperfections in the distributing machines; to poor drillability of the fertilizer; or to segregation of the fertilizer components in the process of drilling. Even when individual plants receive equal quantities of fertilizer the composition of the fertilizer available to each plant may differ greatly so that best conditions for the maintenance of growth and development to maturity of the crop as a whole are not obtained. The

study of methods for producing nonsegregating fertilizers is consequently a matter of the greatest importance. The matter of the replacement of the fertilizer with reference to the seed has also been found to have an important bearing on the action of the fertilizer toward the plant. The importance of the results already obtained; the advisability of their verification by continued work through several crop seasons and under conditions of better control; the the desirability of improving the drillability of fertilizer and of devising processes for making nonsegregating fertilizer mixtures; the inability to complete the studies already inaugurated and the development of new lines of study make necessary the increase recommended.

(b) The plan of the Department will be:

To study the drillability of fertilizers with different physical characteristics in the field and to develop fertilizers which have satisfactory physical properties.

(c) Cooperation:

Certain phases of these investigations are conducted in cooperation with the Bureau of Public Roads; National Fertilizer Association, the National Association of Farm Equipment Manufacturers, the American Society of Agronomy, the American Society of Agricultural Engineers and a number of fertilizer manufacturers who have made substantial contributions. The outcome of this cooperative investigation is largely dependent on the successful solution of the basic investigations undertaken by this division.

(d) Present work:

These investigations are conducted to determine the characteristics and proper method of application of this class of fertilizers which has come into prominence only recently, mainly as a result of developments in nitrogen fixation. The methods of distribution for these concentrated materials require special attention in order that the maximum benefit may be realized from the material applied to the soil.

## Activities under Appropriation for Fertilizer Investigations

Activities under this appropriation are concentrated largely on the development of new processes for the production of nitrogen, phosphate, and potash fertilizers; the study of the practicability of using either new sources of raw products in their production, or of utilizing by-products from other industries; and the determination of the chemical and physical properties of the final products, particularly with regard to their suitability in various fertilizer mixtures. The research program is being developed with the idea that much of the information gained will be of a fundamental nature and have a far-reaching effect.

## (k) SOIL SURVEY

| | |
|---|---|
| Appropriation, 1931 | $310,000 |
| Brookhart Act adjustments | 720 |
| Total, 1931 | 310,720 |
| Budget, 1932 | 328,705 |
| Increase | 17,985 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Detailed & Reconnoissance Surveys | $205,175 | $236,440 | $254,425 | $17,985 (1) |
| Inspection & Correlation | 28,280 | 27,220 | 27,220 | |
| Correlation & Soil Characteristics & Crops | 7,785 | 8,260 | 8,260 | |
| Map drafting | 32,460 | 38,800 | 38,800 | |
| Totals | $273,700 | $310,720 | $328,705 | $17,985 |

The increase of $17,985 is submitted for Detailed & Reconnoissance Surveys.

(a) A growing appreciation of the value of the soil survey has resulted in increased appropriations by the legislatures of the States already cooperating with the Federal Government and in new legislation in other States providing funds for the inauguration of cooperative soil survey work. During the past year the states of Alabama and New York have increased their appropriations and Minnesota, Michigan and Kansas are requesting increases for next year. The state of Virginia recently appropriated $15,000 for soil surveys for the next biennium. To meet this growing demand, it is imperative that the soil survey appropriation be increased from year to year.

(b) The plan of the Department will be:

The increase is for the purpose of meeting cooperation in states where an increased amount of soil survey work is contemplated. The states of Oklahoma, New York, Virginia, Pennsylvania, and Texas plan to expand their soil surveys. Additional resources in personnel will be made available in certain states where the Department has not been able to maintain as many men in the field during the past season as have the states, among which are Minnesota, Indiana, Nebraska, and Kansas. An endeavor will be made in the future to maintain equal working forces with those of the states.

(c) Cooperation:

Practically all the Soil Survey work is accomplished in cooperation with State agencies and the increase will be utilized similarly.

(d) Present work:

This work consists of mapping and classifying the soils of selected areas with a view to providing a soil map of the United States that will furnish a foundation upon which to develop a permanent system of agriculture.

Activities under Appropriation for Soil Survey

The object of the Soil Survey is to map and classify the soils of the United States and make this information available to those interested in agriculture. The ultimate purpose is to provide a soil map of the continental United States, which will furnish a foundation of facts upon which to develop a rational permanent agriculture.

Experiment-station and agricultural-college and extension workers use the reports and maps as a basis for the location of outlying experimental fields and in the application of these results to other areas of similar soils in other localities, thus giving a wide range of adaptation of their results to the soils of the county and State.

## (l) SOIL EROSION

This item is omitted under the Bureau of Chemistry and Soils. It is submitted for 1932 as an item in the miscellaneous section.

## (m) SOIL MICROBIOLOGY

| | |
|---|---|
| Appropriation, 1931 | $ 43,400 |
| Brookhart Act adjustments | 420 |
| Total, 1931 | 43,820 |
| Budget, 1932 | 44,150 |
| Increase | 330 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase U.A.S. |
|---|---|---|---|---|
| Soil Microbiology Investigations | $42,190 | $43,820 | $44,150 | $330 |

The increase of $330 is for under-average salary grade adjustments.

Activities under Appropriation for Soil Microbiology

Investigations are made of the legume nodule bacteria, and their relation to nitrogen fixation and soil improvement; inspection of all brands of legume inoculants offered for sale to the farmer; cooperation with farmers and with the extension service by furnishing inoculation material for legumes introduced into new areas; study of the bacteria and fungi of the soil and their relation to the decomposition of crop residues and green manures plowed under, to oxygen utilization in and carbon dioxide evolution from the soil, to nitrogen fixation, to soil organic matter, to the roots of growing crops, and their influence upon farm practices in crop production.

## (n) SOIL FERTILITY

| | |
|---|---|
| Appropriation, 1931..... | $ 200,000 |
| Allotment, Dairying & Soil Improvement Exp. Station, S.C.. | 9,975* |
| Brookhart Act adjustments..... | 876 |
| Total, 1931..... | 210,851 |
| Budget, 1932..... | 227,080 |
| Increase..... | 16,229 |

*Transfer to this appropriation proposed in Budget, 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Soil Fertility Invs..... | $114,818 | $146,762 | $154,262 | $7,500 (1) |
| Cotton Root-Rot Soil Fertility Work..... | 37,032 | 49,100 | 57,829 | 8,729 (2) |
| Green Manuring or Soil Organic Matter Invs... | 4,550 | 5,014 | 5,014 | |
| South Carolina Station.. | - | 9,975 | 9,975 | |
| Totals..... | $156,400 | $210,851 | $227,080 | $16,229 |

The increase of $16,229 is submitted for the following purposes:

(1) $7,500 for Soil Fertility Investigations

(A) $2,500 for Citrus and Truck crops:

(a) In the southern citrus and truck crop belt a serious situation has developed with reference to soil fertility on soils which are leachy in character and have been shown to be deficient in ordinary available plant nutrient materials, as well as the lesser common soil elements. This increase is requested for the purpose of making a study of the small applications of rare minor elements of plant food, such as manganese, zinc, copper, etc. upon this class of soils. The condition faced is constantly growing more serious and affects the market value of the citrus fruits produced, and in many sections of Florida the trees are of short life, undoubtedly due to malnutrition factors.

(b) The plan of the Department will be:

To expand the field work with fertilizers on citrus and truck crops and to support this with much needed laboratory investigations on the soils and fertilizers used, together with analysis of the crops grown to study the influence of fertilizers on quality. This latter will require new laboratory equipment, apparatus, and supplies, together with assistance.

(c) Cooperation:

The field work will be done in cooperation with the Florida and other state Agricultural Experiment Stations in the southeast. The Florida Agricultural Experiment Station will furnish a man to assist with the work.

(d) Present work:

Fertilizer experiments are being conducted in the field on land assigned by leading farmers with various truck crops, including carrots, cabbages, potatoes, tomatoes, beans, pepper, beets and lettuce, to determine the kind and amount of fertilizer to use economically. Besides these experiments, field studies are being carried on to determine the effect of uncommon elements on truck and citrus crops and of ordinary and concentrated fertilizers on citrus. The field work is supplemented with laboratory and greenhouse investigations.

(B) $2,500 for Fertilizer Placement, Soil Fertility and Fertilizer Studies:

(a) This problem has become particularly urgent as the result of the use of concentrated fertilizers and the new nitrogen materials. The joint Committee on fertilizer placement, consisting of representatives from the American Society of Agronomy, the National Fertilizer Association, the American Farm Equipment Manufacturers,

and the American Society of Agricultural Engineers are cooperating in this work and there has been placed at our disposal this year some $800 for the operating expenses of a member of the staff of this office in the conducting of the work. This is carried on now with cotton in cooperation with the Agricultural Experiment Station of South Carolina, but it is proposed to extend this work to other states in the South and to such crops as potatoes and corn in the northeastern states. The plan is to carry out field experiments, placing the fertilizer at various depths and distances from the seed.

(b) The plan of the Department will be:

To extend the fertilizer placement studies to other crops in the southeastern states, especially in connection with truck crops where large amounts of fertilizer are used. The cotton fertilizer placement work with cotton will also be expanded.

(c) Cooperation:

The work is cooperative with the office of Agricultural Engineering, Bureau of Public Roads, which provides men and machinery, and with the Fertilizer Investigations unit of the Bureau of Chemistry & Soils, which provides men and materials. The joint Committee on Fertilizer Placement of the American Society of Agronomy, National Fertilizer Association, American Farm Equipment Manufacturers and the American Society of Agricultural Engineers is cooperating in the planning of the investigations and is contributing $800 toward the travel expenses of the men.

(d) Present work:

This relates chiefly to field work on sandy soils to determine the best method of distribution and the placement of concentrated and high-analysis fertilizers and the effect thereof on growth and yield of cotton; mechanical means employed to apply the fertilizer mixture at different depths and at varying distances from the seed, and studies to determine the effect of varying rates of application and time of making some have been started.

(C) $2,500 for Potato Soil Fertility and Fertilizer Research in the principal potato growing sections of the northeastern and middle Western states:

(a) It is estimated that the potato crop is valued at $350,000,000 and the industry uses approximately $50,000,000 worth of fertilizer annually in the production of the crop, hence the importance of spending this wisely and economically. The Potato Association of America, through a resolution and specially appointed Committee is urging the Bureau to extend its activities to other important sections and a considerably broader scope of research projects. It stresses work on fertilizer materials, concentrated fertilizers and method of application, as being a primary requisite for successful potato growing to insure marketable size and quality.

Local associations likewise have been insistent that the service which the Bureau has been rendering be augmented to insure greater usefulness under existing conditions in which the growers are faced with the changing fertilizer practice now in operation. The fertilizer manufacturers also press for more definite information as to the effects of the newer chemicals, especially those resulting from nitrogen fixation. The problem demands the inauguration of new work locally in the sections, with the establishing of field laboratories to properly meet the problems presented.

(b) The plan of the Department will be:

To extend the fertilizer investigations with potatoes to include other prominent potato soils for the purpose of determining the most economical rate of application and kind of fertilizer to employ, and to establish field experiments to determine the comparative effectiveness of synthetic nitrogen materials. The influence of fertilizer materials on cooking quality and chemical composition is to be studied through laboratory and greenhouse work.

(c) Cooperation:

The field work is to be conducted in cooperation with the Maine, Pennsylvania, New York, New Jersey, Virginia and other State Agricultural Experiment Stations; also with leading farmers in the different potato growing sections.

(d) Present work:

This embraces soil fertility and fertilizer studies with potatoes in Maine, New York, New Jersey, Pennsylvania and Virginia on leading potato soil types to determine (1) the most suitable proportion of nitrogen, phosphoric acid and potash to use (2) kind and amount of nitrogen materials, including synthetic compounds, to use in potato fertilizer mixtures (3) kind and amount of potash materials to use and (4) most economical rate of application of fertilizer. The work is carried on under actual field conditions, largely with leading growers in different sections.

(2) $8,729 for Cotton Root-Rot Soil Fertility and Fertilizer Investigations.

(a) Under the program presented in 1927 for cotton rot investigations field experiments have been conducted at some fifteen field points during the past two seasons and results which bear on cotton root-rot and cotton production have been secured. Certain fertilizers apparently are giving satisfactory results, among which are ammonia phosphate and nitrogenous fertilizers. Killifering this year greatly reduced the prevalence of cotton root rot. A large number of fertilizers and chemical treatments are being studied to determine their influence on cotton root-rot. Extension of this work is necessary on all cotton root-rot infected soils. A field laboratory has been established in one of the buildings on the University Campus at Austin, Texas, and soils are being examined in the laboratory to determine the chemical differences between root-rot infected and non-infected soils. Laboratory

investigations are also in progress to study the chemical forms of organic matter, the changes which it undergoes with varying methods of soil and farm management, and its influence on the cotton root-rot. The scientific staff should be further increased this year. The project is cooperative between the Bureau of Plant Industry and the Bureau of Chemistry & Soils on the one hand, and the Texas Agricultural Experiment Station on the other. Each is attacking the problem from its respective viewpoint, but the general program has been so arranged that the lines of attack are well coordinated.

(b) The plan of the Department will be:

To extend the soil fertility and fertilizer investigations in the root-rot infected regions of Texas to adequately meet the needs of the program for the eradication or control of the root-rot. There will be needed an additional Associate Soil Scientist and an Assistant, to prosecute the work and some additional machinery for cultural operations in the field work.

(c) Cooperation:

This work will be conducted in cooperation with the Bureau of Plant Industry, for which a $12,000 increase is submitted in the Budget for 1932 under the subappropriation, Cotton Production & Diseases. The Department is also cooperating in this work with the Texas Agricultural Experiment Station, and the University of Texas is furnishing laboratory, office and greenhouse space in this cooperation.

(d) Present work:

Present work on the cotton root-rot problem includes soil fertility and fertilizer investigations on different soil types in Texas where the trouble is acute. Field experiments have been established and many contacts have been made with cotton growers on whose land, in the aggregate, some fifteen to twenty field experiments are being conducted, involving a study of a large number of fertilizer and chemical treatments. Supporting the field work laboratory and greenhouse investigations are being made to determine chemical and other differences between root-rot infected and non-infected soils; also to study the relationship of soil organic matter and its decomposition to cotton root-rot.

## Activities under Appropriation for Soil Fertility

The duties and functions of the Division of Soil Fertility Investigations comprise a fundamental study of the biochemical relationships existing between soils, fertilizer, and crops. The work is carried on through field, laboratory, and greenhouse studies. The field work is conducted at about 50 localities in the United States; the laboratory and greenhouse studies are carried on at the Arlington Experimental Farm.

Fertilizer and soil fertility investigations are conducted on cotton, corn, sugar beets, sugar cane, potatoes, sweet potatoes, citrus fruits, pecans, peaches, and a number of truck and forage crops. The field work is designed to test: (1) the comparative effectiveness of various fertilizer ratios or formulas, as evidenced by crop response and production; (2) the comparative value of different nitrogen, phosphate, and potash carriers for fertilizer usage; (3) the effectiveness of synthetic nitrogen materials; (4) the economy and crop-producing value of concentrated fertilizers, and (5) the effect of uncommon soil elements, such as manganese, copper, etc. on plant growth and crop production.

Field and greenhouse studies are made at the Arlington Farm on the action of fertilizer salts in nutritional investigations. All fertilizer mixtures used in the field investigations on prominent soil types throughout the United States are prepared here. In the laboratories are studied the biochemistry of soil organic matter, the composition of soils, fertilizers, and crops; also the fundamental factors which determine soil fertility.

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Note - Also see Miscellaneous Section for "Work for Other Departments", "Soil Erosion Investigations", "South Carolina Experiment Station", and "Special Corn Borer Research".

## BUREAU OF ENTOMOLOGY

Explanation of change in language: The elimination in the introductory paragraph of the amount of $3,000 and insertion of the amount of $5,000 is recommended in order to more fully provide for the needs of the Bureau. The elimination of the word "insectaries" is recommended in order to clarify the language as to exclusion from the building limitation of temporary sheds and shelters often required in connection with proper handling of insects at field stations.

### (a) GENERAL ADMINISTRATIVE EXPENSES

| | |
|---|---|
| Appropriation, 1931 | $93,000 |
| Brookhart Act adjustments | 1,380 |
| Total, 1931 | 94,380 |
| Budget, 1932 | 94,380 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Administration | $90,992 | $94,380 | $94,380 |

Activities under this Appropriation

This appropriation provides for the general business operations of the Bureau, including Accounts, Audits, Supplies, Property, Personnel, Editorial, and Library.

### (b) DECIDUOUS FRUIT INSECTS

| | |
|---|---|
| Appropriation, 1931 | $394,210 |
| Allotment, First Deficiency Act, 1930 | 60,000* |
| Brookhart Act adjustments | 1,400 |
| Total, 1931 | 455,610 |
| Budget, 1932 | 474,950 |
| Increase | 19,340 |

* Transfer to this appropriation for Oriental Fruit Moth, proposed in 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase W.F. | Foreign Quarters Allowance |
|---|---|---|---|---|---|
| Apple Insects ..... | $ 61,640 | $ 72,150 | $ 72,150 | - - - - | |
| Peach Insects ..... | 76,040 | 107,500 | 125,090 | 16,640(2) | 950 |
| Grape Insects ..... | 5,891 | 6,095 | 6,095 | - - - - | |
| Nut Insects ..... | 30,233 | 38,335 | 38,335 | - - - - | |
| Orchard Insecticides and Spraying Machinery .... | 18,534 | 18,550 | 18,550 | - - - - | |
| Orchard Insect Survey ... | 4,010 | 4,025 | 4,025 | - - - - | |
| Blueberry Maggot ..... | 12,152 | 7,155 | 7,155 | - - - - | |
| Japanese Beetle Research | 147,524 | 169,840 | 171,490 | - - - - | 1,650 |
| Asiatic Beetle Research . | 15,490 | 16,170 | 16,270 | - - - - | 100 |
| Plant Disinfection Investigation | 15,745 | 15,790 | 15,790 | - - - - | |
| Totals ..... | $387,259 | $455,610 | $474,950 | $16,640(2) | $2,700(1) |

The increase of $19,340 is submitted for the following purpose:

(1) $2,700 Foreign quarters, heat, fuel and light allowances.

(2) $16,640 increase in working funds for continuing investigations of the Oriental fruit moth:

(a) Funds were provided by the last Congress in the First Deficiency Bill for the Fiscal Year 1930, and continued through the Fiscal Year 1931, in the amount of $100,000, $20,000 of which was used for enlarging important research work and $80,000 for the establishment and maintenance of two 500 acre experiments in the use of bait traps to catch the moths, one located in southern Indiana and the other in north Georgia. The increase in funds requested, is to supplement the balance available from the Deficiency Appropriation so that during the calendar year 1931 the research work may be continued and provision made for completing the bait trap experiments in at least one of the experimental localities.

(b) The Plan of the Department will be:

To continue investigations as to the possibility of propagation and distribution of two or three of the parasites of the Oriental fruit moth which have already been determined

to be of great value in its control; to continue investigations of insecticides, both in the laboratory and field, and to obtain additional data on the value, in control of the moth, of containers baited with attractive materials exposed in the trees over a sufficiently large area in order that the results will not be affected by migration of the moths.

(c) Cooperation:

Purdue University, Lafayette, Indiana; Georgia State Board of Entomology, Atlanta, Ga., and numerous fruit growers.

(d) Present work:

At the present time, $26,400 of the regular appropriation for Deciduous Fruit Insects is utilized on investigations of the Oriental fruit moth. This sum is allotted to the following activities: study of and rearing of domestic parasites; collecting and rearing of foreign parasites; insecticide investigations; studies in the ecology and biology of the insect. The deficiency appropriation is allotted as shown above.

Activities under Appropriation for Deciduous Fruit Insects.

The investigations now being conducted under this subappropriation are concerned with the control of insects affecting deciduous fruits and related crops, including apple, peach, grape, nuts, cranberries and blueberries. This unit is also concerned with an orchard insect survey, the investigation of orchard insecticides, and the development of methods for disinfecting plants, and includes investigations on the Japanese and Asiatic beetles.

Important activities under this appropriation for which funds were recently allotted include, (a) investigations of parasites of the Japanese beetle, (b) insects attacking the pecan, (c) peach insect investigations in Tennessee, (d) apple insect investigations in the Pacific Northwest, (e) investigations of the Oriental fruit moth.

## (c) SUBTROPICAL PLANT INSECTS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 166,500 |
| Brookhart Act adjustments ..... | 860 |
| Total, 1931 ..... | 167,360 |
| Budget, 1932 ..... | 179,415 |
| Increase ..... | 12,055 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Citrus insects in Gulf region ..... | $ 19,572 | $ 21,011 | $ 22,461 | $ 1,450(1) |
| Greenhouse insects ..... | 16,756 | 23,565 | 23,565 | ----- |
| Bulb insects ..... | 22,582 | 23,040 | 23,040 | ----- |
| Fruit flies in Hawaii ... | 7,938 | 8,025 | 8,025 | ----- |
| Fruit flies in Canal Zone | 3,666 | 3,840 | 3,840 | ----- |
| Insects affecting miscellaneous ornamentals ... | 13,639 | 13,884 | 13,884 | ----- |
| Citrus insects in California ..... | 8,992 | 34,435 | 34,435 | ----- |
| Mexican fruit worm ..... | 34,245 | 35,860 | 40,085 | 4,225(1) |
| Parlatoria date scale ... | 3,577 | 3,700 | 3,700 | ----- |
| Argentine Ant ..... | ------ | ------ | 6,380 | 6,380(2) |
| Totals | $130,967 | $167,360 | $179,415 | $ 12,055 |

The increase of $12,055 is submitted for the following purpose:

(1) $5,675 Foreign quarters, heat, fuel and light allowance.

(2) $6,380 increase in working funds, for improving methods for the control of the Argentine Ant:

(a) During the past few years the Argentine ant has become such an increasingly serious menace in the South that it now presents a very acute problem in the affected areas to householders and agriculturists. Its injuries have assumed such proportions that interest in the solution of the problem has become widespread. In households it is one of the most annoying and destructive pests. It is an omnivorous feeder eating all kinds of foods. It invades dwellings, including beds and bedrooms, and at times conditions become so intolerable that houses cannot be rented and realty values decline. In citrus and other fruit orchards the damage is chiefly due to the relationship which the ant maintains with such destructive pests as mealybugs and related scale

insects. The ant collects a sweetish secretion or "honeydew" which they exude and in turn protects the mealybugs and scale insects from their natural enemies, resulting in an enormous increase in numbers with a proportionate increase in damage to the trees and fruit so infested. For a similar reason an increase in mealybug damage has been noted in the sugar cane fields of Louisiana.

(b) The plan of the Department will be:

To investigate the development and control of this ant under all conditions with a view of obtaining information which might be utilized as a basis in aiding local eradication campaigns that are now being undertaken. It is planned to investigate its behavior in the various conditions under which the ant thrives. The control methods now in use will be reinvestigated from the standpoint of improving these as well as developing more efficient and cheaper ones.

(c) Cooperation:

The States of Mississippi, Louisiana, Alabama and Arkansas are keenly interested in any investigational work that may be undertaken on this pest and will undoubtedly cooperate in a substantial manner in testing and demonstrating control methods.

(d) Present work:

No work is being done by the Bureau on this problem at present but it is planned to use some of the physical equipment and laboratory space of the Division Laboratory at New Orleans for this undertaking thus saving the rental and overhead charges that would otherwise be necessary.

## Activities under Appropriation for Subtropical Plant Insects

The investigations now being conducted under this appropriation include,(1) Citrus Insects in the Gulf Region, including the rust mite, (2) Citrus Insects in California including the citrus thrips, (3) Insects affecting flowering and ornamental plants grown in the greenhouses, (4) Insects attacking narcissus bulbs and related bulb cultures, (5) Fruit Flies in Hawaii and the Canal Zone, (6) Insects affecting Ornamental plants grown under slat and in nurseries in Southeastern United States, (7) the Mexican Fruit worm and, (8) the Parlatoria Date Scale.

Important activities under this appropriation of recent interest include, (a) research on the Mexican fruit worm in its natural home and the development of effective control measure, (b) the control of the bulb flies and mites on narcissus and related cultures, (c) the control of the citrus thrips in California, and (d) a restudy of Hydrocyanic acid gas fumigation of citrus for control of resistant scale insects in California.

## (d) TRUCK CROP INSECTS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 397,474 |
| Less Allotment, Pea Weevil investigations ..... | 5,000 * |
| | 392,474 |
| Brookhart Act adjustments ..... | 1,860 |
| Total, 1931 ..... | 394,334 |
| Budget, 1932 ..... | 419,185 |
| Increase ..... | $ 24,851 |

*Transfer to appropriation "Stored Product Insects" proposed in Budget, 1932

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase W.F. | Foreign Quarters Allowance |
|---|---|---|---|---|---|
| Miscellaneous truck crop insects ..... | $ 64,671 | $ 65,320 | $ 74,846 | $ 9,526(2) | ---- |
| Pea insects ..... | 8,740 | 8,960 | 8,960 | ------- | ---- |
| Sweet potato weevil control | 42,391 | 42,757 | 42,757 | ------- | ---- |
| Berry insects ..... | 7,181 | 11,410 | 21,410 | 10,000(3) | |
| Soil insects ..... | 33,365 | 66,375 | 66,375 | ------- | ---- |
| Sugar beet insects .... | 117,803 | 118,085 | 118,085 | ------- | ---- |
| Tobacco insects ..... | 27,594 | 27,927 | 27,927 | ------- | ---- |
| Bean insects ..... | 39,659 | 47,300 | 52,625 | 5,000(4) | 325(1) |
| Mushroom insects ..... | 6,046 | 6,200 | 6,200 | ------- | ---- |
| Totals..... | $347,450 | $394,334 | $419,185 | $24,526 | $325(1) |

The increase of $24,851 is submitted for the following purpose:

(1) $325 Foreign quarters, heat, fuel and light allowance.

$24,526 increase in working funds, as follows:

(2) $9,526 for the development of remedies for the turnip aphid:

(a) The turnip aphid or louse is a serious hindrance to the economic culture of cole crops such as turnips, kale, cabbage, mustard, and broccoli in the areas of early vegetable production in the south and southwest. The climatic conditions which are favorable to the development of these crops are also favorable to the development of the turnip louse and consequently this insect is also troublesome over the greater part of the eastern states during the early spring and fall months. With the increase in the culture of such crops and their production in large quantities in certain restricted areas the aphid is a continuing threat to their cultivation and the total loss of crop over considerable

areas is not unusual. No satisfactory remedy for the pest is known. Control measures which are used against other plant lice are not effective against the turnip louse because the cool weather which prevails at the time of the pest's greatest abundance considerably reduces the action of the usual treatments. In addition the pest is difficult to reach as infested plants wilt through loss of plant juices produced by the feeding of the insect, and it is thus well protected beneath the wilted leaves which lay close to the surface of the soil.

(b) The plan of the Department will be:

To develop insecticides in the form of dust contact poisons and modify dusting equipment which can be used on crops sown both broadcast and in the row. Especial emphasis will be placed on the development of a poison which will retain its effectiveness under conditions of cool and moist weather. Experiments will also be conducted to determine the value of early treatments for the insect in an endeavor to entirely prevent the later and more serious infestations.

(c) Cooperation:

This project will be conducted in cooperation with the Louisiana Experiment Station which will furnish laboratory quarters for the work.

(d) Present work:

Up to the present investigations of the Department for the control of the turnip aphid have been in an endeavor to adapt the insecticides used at present for the control of this insect. Owing to the small amount of funds which could be utilized for this purpose only small scale experiments were undertaken but in all of these it was found that the remedies normally used against plant lice were of minor effectiveness against the turnip aphid unless concentrations were materially increased, which reduce the net returns from the crop.

(3) $10,000 for developing control measures for the raspberry fruit worm:

(a) The raspberry fruit worm is a particularly severe enemy of the ripe berry since it ruins the fruit and makes it unfit for consumption. The production of worm-free berries is absolutely necessary as the canners, in order to comply with the pure food laws, reject whole crops of berries when they show worm infestations and thus even light infestations may cause total loss of the crop to the individual grower. Conditions in the northwest favor the insect in maintaining itself as an annual pest and during recent years

outbreaks of this insect have increased in intensity. The fruitworm has been particularly severe on loganberries, the entire crop from some sections being a total loss because of wormy fruits with resultant decreasing acreage. Unless adequate control measures can be developed, particularly as to loganberries, the continuation of the industry is threatened. The raspberry and loganberry crops in the affected area are now worth approximately $4,283,000 a year to the growers.

(b) The plan of the Department will be:

To investigate the efficiency of both direct and indirect control measures in order to develop a control program which will be effective and which the farmers will utilize readily. Owing to the peculiar life history of the insect it is probable that a combination of sanitary and insecticidal control measures will be necessary.

(c) Present work:

No work is being done by the Department directly on the problem of controlling the raspberry fruit worm although some survey work has been conducted from the laboratory located at Puyallup, Washington, and preliminary observations have been made on the development of the insect and the way in which it passes the winter.

(4) $5,000 to undertake investigations to determine the practical methods for the control of the Mexican bean beetle in the dry bean section of the southwest:

(a) The bean beetle is a constant menace to the bean crop in the southwest where the commercial acreage is large - 70,000 acres in one country - and owing to the comparatively low returns per acre and the large acreages involved there is an urgent need for a remedy which can be applied with profit to the growers. The low acreage value of the crop makes impossible the utilization of the remedies now employed for this insect in the east and at the present time no remedy is available to the growers in this dry bean growing section where years of heavy losses have seriously undermined the stability of this industry.

(b) The plan of the Department will be:

To develop remedies which can be employed at a small cost and profitably applied during years of heaviest outbreaks of the pest. Some of the insecticides now in use will probably be found to be successful but in order to bring their use within reach of the average grower it will be necessary to improve

methods of application and work out a program based on time of application and insect abundance which will reduce the number of applications to a minimum.

(c) Cooperation:

This work, as with the work now under way in New Mexico on this insect will be carried out under informal cooperation with the New Mexico Experiment Station.

(d) Present work:

The Department is now studying this insect under southwestern conditions on an allotment of $6,500 for the fiscal year 1931. The current allotment is being expended on an investigation of the development and life history of the insect particularly those factors which have a bearing on the overwintering of the beetle and spring development and which are most important from a control standpoint. A complete knowledge of these phases of the problem is essential in the development of a program of control as timely applications to conserve labor and material must be made if a profitable return is to be had during seasons of great abundance of the pest. Laboratory work has also been undertaken to determine the poisons most effective against the insect and the effect of such poisons on the bean plant under southwestern conditions.

## Activities under Appropriation for Truck Crop Insects

The work carried on under this appropriation includes investigations of and the development of remedies for the insect pests of truck and market garden crops including potatoes, tomatoes, cabbage, beans, peas, etc., and such related crops as sugar beets and tobacco. This sub-appropriation also includes work on the insects which attach berries and cultivated mushrooms and also such general pests as the European earwig and wireworms.

Specific investigations which have been of particular interest recently include (a) the control of wireworms in the Pacific northwest and South Carolina, (b) the determination of the range, and methods for avoiding losses from the sugar-beet leafhopper, (c) development for control of the lima-bean pod borer, (d) investigations of the habits and control of the European earwig, (e) introduction of parasites of the Mexican bean beetle, (f) studies of sanitation and fumigation for the control of mushroom pests.

## (e) FOREST INSECTS

| | |
|---|---|
| Appropriation, 1931 ..... | $220,000 |
| Brookhart Act adjustments ..... | 1,480 |
| Total, 1931 ..... | 221,480 |
| Budget, 1932 ..... | 243,590 |
| Increase ..... | 22,110 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Insects Affecting Forest Trees .... | $ 28,780 | $29,550 | $ 38,010 | $ 8,460(3) |
| Insects Affecting Forest Products . | 6,144 | 6,280 | 6,280 | - - - |
| Cooperative Forest Insect Control . | 63,716 | 74,770 | 84,770 | 10,000(2) |
| Gipsy and Brown-tail Moths Research | 98,829 | 100,880 | 104,530 | 3,650(1) |
| Shade and Hardy Shrub Insects ..... | 4,015 | 10,000 | 10,000 | - - - |
| Totals | $ 201,484 | $ 221,480 | $243,590 | $ 22,110 |

The increase of $22,110 is submitted for the following purpose:

(1) $3,650 Foreign quarters, heat, fuel and light allowance.

$18,460 increase in working funds, as follows:

(2) $10,000 for more adequate research on barkbeetle control:

(a) At two recently established field stations (Portland, Oregon, and Albuquerque, N.M.), investigations are being pushed on barkbeetles and advice on methods for their control is being given to private timberland owners, and Federal forest and timberland administrators. Demand for the speeding of research work is increasing with the more general appreciation of the seriousness of the western barkbeetles now occasioning a loss of $15,000,000 to $20,000,000 annually. The greater adoption of control measures by Federal and private agencies also demands each year an increasing amount of service from the Bureau. At present approximately 75% of the funds allotted to this work are being used for service and expert advice, thus making available an inadequate amount for research to develop better and cheaper remedies.

This requested increase is in accordance with the provisions of Section 4 of the McNary - McSweeny Forestry Research Act

and agrees also with the recommendations of the Forest Protection Board to the Bureau of the Budget (Report of April 1, 1929).

(b) The plan of the Department will be:

To employ additional technical assistance and temporary help for the purpose of broadening the scope of the investigations pertaining to barkbeetle control. Such methods as merely felling the infested trees at certain seasons of the year, burning of the infested trees while standing, treatments at such times to do least harm to the associated predators, and parasites, and inoculation of infested trees with chemicals will be tested more thoroughly. Experimental work with the large mature timber killed by these beetles involves enormous physical difficulties which are a serious handicap to conducting tests on an adequate scale.

(c) Cooperation:

This work will be conducted in cooperation with the Forest Service, National Park Service, and private owners.

(d) Present work:

Four field stations in the western states are maintained, with an appropriation of $74,510. Over 75% of this money is used in providing technical service to cooperative agencies (federal and private) and the balance on research to determine the most economical methods for preventing or controlling outbreaks of these insects.

(3) $8,460 for locust borer investigations:

(a) The locust borer is the chief enemy of the black locust and it has of late years virtually caused the abandonment of extensive plantations and discouraged to a considerable extent the planting of this valuable tree. Black locust is a fast-growing tree producing wood of high value for posts and ties, and for many other purposes. It is a tree easy to propagate, enriches the soil, checks erosion and is well suited to use on farm woodlots and unproductive soil. It is believed that a successful and easily maintained method of control for the borer can be found and such a result would by encouraging culture of the black locust reduce to a considerable extent the loss occasioned by the disappearance of chestnut from the forests of the Eastern United States.

(b) The plan of the Department will be:

To first make a general survey of the condition of black locust plantations which have been set out in the past 25 years throughout the Ohio and Tennessee River drainages. Although many of the plantations have been severely injured or even totally

destroyed, some have had remarkably little injury. A comparative study of the conditions under which these stands have developed will be made, with the hope of obtaining information on the proper plantation management for growing the tree and avoiding injury by the borer.

(c) Cooperation:

Central States Forest Experiment Station and State Forestry Departments of several central States.

(d) Present work:

This is a new subproject on which no investigations have been undertaken.

Activities under Appropriation for Forest Insects.

The work under this appropriation consists chiefly of research on the problems connected with insects affecting forest trees, forest products, shade trees and hardy ornamentals, and includes the gypsy and brown-tail moths. The investigations include a study of the habits and developments of the insects concerned, the determination and perfection of methods of controlling the various injurious species, and also the giving of advice and direction to Federal, State, and private owners for combating such insects.

Investigations of recent interest include, (a) the development of control methods for western barkbeetles and (b) shade tree insect control.

(f) CEREAL AND FORAGE INSECTS

| | |
|---|---|
| Appropriation, 1931 | $545,000 |
| Brookhart Act adjustments | 2,500 |
| Total, 1931 | 547,500 |
| Budget, 1932 | 586,220 |
| Increase | 38,720 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Cereal Insects ..... | $ 35,117 | $ 35,750 | $ 41,570 | $ 5,820 (2) |
| Forage Insects ..... | 58,398 | 79,205 | 99,205 | 20,000 (3-4) |
| Grasshopper control .. | 31,411 | 37,180 | 37,180 | - - - |
| Alfalfa Weevil ..... | 26,442 | 31,125 | 39,125 | 8,000 (5) |
| Hessian fly ..... | 34,991 | 35,410 | 35,410 | - - - |
| Chinch Bug ..... | 17,732 | 17,770 | 17,770 | - - - |
| European Corn Borer Research ..... | 266,390 | 268,100 | 272,400 | 4,300 (1) |
| Sugar Cane and Rice Insects ..... | 32,542 | 42,960 | 43,560 | 600 (1) |
| Totals..... | $503,023 | $547,500 | $586,220 | $38,720 |

The increase of $38,720 is submitted for the following purpose:

(1) $4,900 Foreign quarters, heat, fuel and light allowance.

$33,820 increase in working funds, as follows:

(2) $5,820 for the investigation of insects injurious to wheat in the Pacific Northwest:

(a) Various insects injurious to wheat and other small grains, particularly the true and false wireworms, have caused increasing losses in the Pacific Northwest during recent years. Various species of wireworms are concerned, the different species being adapted to particular conditions; thus damage to the crop occurs in the sections where rainfall is light as well as in sections where rainfall is heavy. The detailed habits of this group of subterranean pests are not well known. While the losses occasioned from this group of insects have been realized, a thorough study of their habits and control has not been undertaken because of lack of funds. The problem is a very complex and difficult one, requiring several years for anything like an adequate investigation and will require ample and continued financial support.

(b) The plan of the Department will be:

To make a thorough study of the habits of the various insects injurious to wheat in the Northwest and to investigate the cultural practices utilized in the production of this important crop with the idea of making some adjustment less favorable to the increase of the insects and thus make possible at small cost the reduction of crop losses.

(c) Cooperation:

This investigation will be conducted in cooperation with the States of Washington, Oregon and Idaho.

(d) Present work:

No work is now under way on this specific activity.

(3) $10,000 for the investigation of alfalfa aphis and related insects:

(a) These insects frequently cause the loss of the first cutting, the most profitable hay crop of alfalfa, and reduce the value of subsequent cuttings either by delay in growth due to direct feeding or by deposits of honey dew, causing fermentation. The injury recently has extended throughout the region west of the Mississippi, where the bulk of this $600,000,000 crop is grown. A new problem is thus presented, and over an area so extensive that studies must be made at a number of points in order to be certain that the remedies developed will be successful under the varying conditions of different localities.

(b) The plan of the Department will be:

To develop control methods, both mechanical and cultural, which will be effective both in the irrigated sections of California, Nevada, Idaho and other States, as well as the alfalfa-producing sections of Iowa, Kansas, Nebraska, Oklahoma, and other Great Plain States.

(c) Cooperation:

There is no formal cooperation on this project although some of the Experiment Stations concerned are doing some work on it. All of this work is being coordinated to avoid duplication.

(d) Present work:

At present there are no funds for an investigation of this problem and only incidental observations have been made in connection with work on other insects.

(4) $10,000 for alfalfa seed chalcid investigations:

(a) This insect presents a very serious handicap to the alfalfa seed producing industry of the Southwestern and inter-mountain States. The investigation of this problem has been greatly impeded by the impossibility of renting ground for experimental plats for a period long enough to permit the continuous

cultural and other operations necessary to obtain a solution to the seed chalcid problem. Owners are generally unwilling to rent their better lands for this purpose and when willing have done so for a few years and then justly believe that someone else should take their turn. The result has been that the work has necessarily been shifted from one field to another or from one locality to another thereby changing the environment of the experiment and confusing the results obtained. The solution of this difficulty would be expedited by the purchase of a suitable plat of ground. The rent for suitable land should in ten years, the estimated life of the experiment, pay for such a tract of land. The possession of this land by the Federal Government not only furnishes a means for conducting the experimental work in an efficient manner, but will, by the sale of hay and seed, return annually an appreciable sum to the Federal treasury.

(b) The plan of the Department will be:

To purchase land suitable for continuous cultural and control experiments.

(c) Cooperation:
The States of Nevada and Utah cooperate with the Department on this general problem, but no suitable State-owned land is available for this experimental work.

(d) Present work:

At present approximately $12,000 is being expended on this problem and the work which is being done consists of time-of-cutting experiments and cultural practices, as well as the investigation of the seasonal development of the insect under field conditions as affected by these various cultural control measures.

(5) $8,000 for the investigation of habits and control of the alfalfa weevil in Southern Oregon:

(a) The alfalfa weevil, which originally was known to occur in a comparatively small area around Salt Lake City, has now spread to areas in other States where climatic and other conditions are essentially different. During the summer of 1929, a rather severe infestation was discovered at Medford, Oregon, a jump of some 200 miles from the nearest known infestation, and marking the first appearance of the pest west of the Cascade Mountains. Conditions here are quite different from those of the intermountain region where

investigations are now in progress, and local research will be necessary in order to be certain that the remedies developed will be useful under crop and climatic conditions existing in Southern Oregon.

(b) The plan of the Department will be:

To make a complete restudy of the insect under conditions prevailing in the regions to which it has recently spread with the idea of adjusting to these new conditions the control measures which have been found effective in the older infested areas.

(c) Present work:

At present $4,380 is available for work directly on this new problem and is being utilized for preliminary surveys and such seasonal history studies as can be accomplished with the funds available.

## Activities under Appropriation for Cereal and Forage Insects

This subappropriation provides for the investigation of insects affecting cereal and forage crops including sugar cane and rice. The object of these studies is to develop control measures by which the injury caused by these insects may be reduced. The service thus provided is distributed through all of the important corn and grain producing States of the Union. While the value of these crops amounts to several billion dollars in the aggregate, the acreage value is usually relatively small, and consequently the amount which can be expended in combating insect pests likewise is limited. Such control measures usually consist of appropriate adaptations of regular farm practices, and the continuation of the basic investigations over a period of several years is of primary importance. Among the more important subjects of research are the European corn borer, Hessian fly, white grubs, wireworms, joint worms, corn earworm, cutworms, chinch bug, leafhoppers, and grasshoppers and crickets, including the Mormon cricket, alfalfa weevil, sugar cane borers and many others.

Important activities under this appropriation for which funds were recently allotted include the investigation of (a) the alfalfa leafhopper, (b) the range caterpillar, (c) the alfalfa weevil, (d) parasites of the European corn borer, (e) the sugar cane moth borer as a pest of corn, (f) parasites of the sugar cane moth borer, and (g) the control of the Mormon cricket.

## (g) COTTON INSECTS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 303,120 |
| Brookhart Act adjustments ..... | 1,700 |
| Total, 1931 ..... | 304,820 |
| Budget, 1932 ..... | 304,820 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 |
|---|---|---|---|
| Cotton boll weevil ..... | $ 171,417 | $174,480 | $ 174,480 |
| Miscellaneous cotton insects ..... | 56,842 | 59,090 | 59,090 |
| Arizona weevil .. | 34,783 | 35,385 | 35,385 |
| Pink boll worm .. | 35,093 | 35,865 | 35,865 |
| Totals..... | $ 298,135 | $304,820 | $304,820 |

There is no increase in working funds under this subappropriation.

### Activities under Appropriation for Cotton Insects

The funds appropriated under this heading are used for the investigation of insects injurious to the cotton crop with a view to the development of practicable control measures or where such appears to be feasible the development of methods which may be utilized in eradication campaigns. The principal insects dealt with under this subappropriation are the cotton boll weevil, the pink bollworm, the Arizona weevil, the bollworm, leafworm and flea hopper.

Specific lines of work which have been of particular interest recently include (a) Investigation of methods for disposing of gin trash, (b) collection of pink bollworm parasites, (c) investigation of the control of the pink bollworm.

## (h) INSECTS AFFECTING MAN AND ANIMALS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 131,000 |
| Brookhart Act adjustments ..... | 560 |
| Total, 1931 ..... | 131,560 |
| Budget, 1932 ..... | 159,500 |
| Increase ..... | 27,940 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Insects affecting man ..... | $ 25,730 | 33,920 | 43,920 | 10,000(1) |
| Insects affecting cattle .. | 44,009 | 49,180 | 57,120 | 7,940(2) |
| Insects affecting poultry . and birds ..... | 997 | 1,000 | 1,000 | - - - |
| Insects affecting sheep and goats ..... | 24,579 | 25,160 | 35,160 | 10,000(3) |
| Insects affecting miscellaneous animals ..... | 161 | 6,200 | 6,200 | - - - |
| Sand fly investigations.... | - - - - | 16,100 | 16,100 | - - - |
| Totals ..... | $95,476 | $131,560 | $159,500 | $27,940 |

The increase of $27,940 is submitted for the following purpose:

(1) $10,000 for the utilization of fly larvae in treating osteomyelitis:

(a) Osteomyelitis is a disease of the bone which causes untold suffering, disability and death to thousands of people from all walks of life, especially children and service men who sustained deep wounds. According to figures compiled by the Veterans Bureau there were 5,356 compensable cases of acute, chronic and tuberculous osteomyelitis among the veterans during the years 1927 to 1929 inclusive. The compensation paid to these different groups ranged from $40,025 to $56,564, per month and the period of disability averaged from 80 to 139 days per case. Recently Dr. Wm. S. Baer of Johns Hopkins University discovered that blow fly maggots introduced into the lesions, after removing the diseased bone as far as possible by surgery, will produce remarkable cures. In some cases as many as 39 operations have been performed upon a single patient without effecting a cure by the old method, whereas by the new one complete healing results in about six weeks. One of the main needs of the surgeons of the country now is sound fundamental knowledge of the entomological aspects of the problem. Practically nothing is known of the food habits and secretions of blow fly larvae and there is immediate need for information on what species of flies will give the best results. It is now suspected that the secretions of the larvae play a very large part in the healing process. It is also imperative that methods be developed of propagating the flies so as to have ample supplies on hand at all times to meet the demands of the surgeons. It is further necessary to develop methods of producing sterile cultures so as to give absolute protection to patients against the introduction of gas gangrene, lock-jaw and other dangerous diseases.

(b) The plan of the Department will be:

To determine the species of flies most effective in the treatment and most easily propagated and handled, to devise ways of rearing flies and producing larvae so as to have an ample supply of material available at all times, to develop methods of sterilizing cultures of larvae, to perfect technique in the application of larvae to the lesions, to study the feeding habits and secretions of the larvae to determine how the results noted are brought brought about and the possibility of using larval secretions rather than the maggots themselves.

(c) Cooperation:

The studies of the relationship of the larvae to wounds will be carried out in cooperation with Dr. Wm. S. Baer in the Children's Hospital in Baltimore, Maryland, and in the Army and Navy Hospitals in Washington. The laboratory facilities and personnel for the bacteriological work will be furnished by these institutions.

(d) Present work:

Work now being done in this bureau on the screw worm and other flies which attack live stock will form an excellent basis for investigations in this field. Some preliminary studies of methods of rearing the flies which seem most promising for use in osteomyelitis treatment are under way incidental to other investigations.

(2) $7,940 for investigations of methods of controlling flies affecting the dairy industry:

(a) Profits in the dairy industry are severely cut by the effect on the cattle of several species of flies. The quality of dairy products is also adversely affected and such products may be rendered dangerous to health by fly contamination. In attempts to reduce these losses and hazards large sums are spent for fly sprays and protective devices, many of which are ineffective or positively injurious to the cattle or the products. The horn fly, stable fly and house fly are present in all parts of the country and other flies add to the severity of the trouble in many regions. The problem is one of nation-wide importance. Practically every year there are serious outbreaks of flies in some sections of the country and in such areas the losses are very great. Often the production in dairy herds is cut from 10% to 30% and in some cases cows are completely dried up. Flesh condition is greatly reduced under such conditions and death losses have occurred.

(b) The plan of the Department will be:

To attack this problem in a number of different ways, including the development of an effective killing and repelling fly spray, the perfection of spray pumps and nozzles especially adapted for the application of sprays to live stock, the testing of fly traps and baits for the destruction of flies, and the working out of practical methods of preventing fly breeding in manure, straw and other materials.

Through cooperation with the Extension Service and Bureau of Dairying, the methods developed will be demonstrated in various regions so that their practicability may be determined and the stockmen be familiarized with them.

(c) Cooperation:

Some phases of the work, particularly the determination of the effect of sprays on the live stock and dairy products will be conducted in cooperation with the Bureau of Dairy Industry. Farmers and dairymen will cooperate by permitting fly sprays to be tested on their herds.

(d) Present Work:

Incident to other projects, some preliminary investigations have been conducted to determine the insecticidal value of certain materials used as fly sprays. Experiments conducted with traps for the control of flies about meat packing establishments have furnished much information which will aid in the prosecution of this phase of the work.

(3) $10,000 for the investigation of the screw worm and wool maggot:

(a) Throughout the range country of the southwest the screw worm is causing heavy losses to owners of live stock of all classes. The stockmen of the southwest regard this as the most serious problem with which they are confronted and estimate the annual loss at $10,000,000. In this region and the range areas throughout the west the wool maggot is a serious pest of sheep. The live stock industry at present is in such condition that it can not well sustain such a tax and there is urgent need of perfecting better methods of combating these pests. At present hundreds of thousands of dollars are expended by ranchmen for remedies and traps and the entire industry is looking to the Department for sound advice to guide them in their control efforts.

(b) The plan of the Department will be:

To develop a thoroughly practical method of utilizing fly traps under range conditions. This will involve the testing of various types of traps and determining the most effective locations for

traps and methods of baiting them. Especial attention will be given to devising large carcass traps which will, at the same time, prevent fly breeding in the carcasses, trap the flies over large areas of pasture, and favor parasite multiplication. The native parasites and predators in the affected region will be investigated and attempts will be made to increase their efficacy in controlling the pests.

(c) Cooperation:

Certain phases of the investigation will be carried on in cooperation with the Texas Experiment Station at its Substation No. 14 near Sonora, Texas, where laboratory and ranch facilities are available. The area trapping tests will be conducted in cooperation with ranchmen and county agricultural agents in the areas where such tests are located.

(d) Present Work:

A portion of the funds (about $16,000) under the projects "Insects Affecting Sheep and Goats" and "Insects Affecting Cattle" are devoted to screw worm investigations. A trap has been devised and is being widely used by the ranchmen but much is yet to be learned about its operation on a range basis and under the different conditions prevailing in the screw worm territory. Preliminary studies of one native parasite are under way and investigations of insecticides for use in destroying the worms in wounds and of repelling the flies are being conducted. An excellent larvicide has been discovered and progress is being made on the development of practical repellents. Methods of disposing of carcasses and of protecting injured or worm infested stock by means of fly-proof houses have been developed.

Activities under Appropriation for Insects affecting Man and Animals

The investigations now being conducted by this division relate to insects which affect man or animals either by direct attack or by carrying disease. Among the insects which affect man, especial attention is given to malaria mosquitoes, various pest mosquitoes, the house fly, eye gnat and sand flies. Among live stock pests being investigated are the cattle grub, screw worm, various lice, ticks, and mites. Other investigations relating to methods of controlling poultry parasites, such as mites, ticks and lice are under way.

Important activities under this appropriation for which funds were recently allotted include, (a) mosquito investigations in the northwest, (b) investigations of insects affecting the reindeer, (c) sand fly investigations, (d) investigations of ticks.

## (i) STORED PRODUCT INSECTS

| | |
|---|---|
| Appropriation, 1931 ..... | $ 96,900 |
| Allotment, Truck Crop Insects, Pea weevil investigations ..... | 5,000* |
| Brookhart Act adjustments ..... | 780 |
| Total, 1931 ..... | 102,680 |
| Budget, 1932 ..... | 136,920 |
| Increase ..... | 34,240 |

*Transfer to this appropriation proposed in Budget, 1932.

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Bean Weevil Investigations .. | $ 9,960 | $10,472 | $10,472 | - - - |
| Stored Grain Insects ..... | 35,199 | 38,173 | 38,173 | - - - |
| Dried Fruit Insects ..... | 14,584 | 15,633 | 15,633 | - - - |
| Household Insects ..... | 3,724 | 14,162 | 14,162 | - - - |
| Cold Storage Experiments .... | 2,550 | 2,765 | 2,765 | - - - |
| Fumigation Experiments ..... | 1,160 | 11,475 | 35,715 | 24,240(1) |
| Pea Weevil Investigations ... | - - - | 5,000 | 15,000 | 10,000(2) |
| Insects Injurious to Confections ..... | - - - | 5,000 | 5,000 | - - - |
| Totals ..... | $67,177 | $102,680 | $ 136,920 | $ 34,240 |

The increase of $34,240 is submitted for the following purpose:

(1) $24,240 for the investigation of a tobacco moth in stored tobacco:

(a) Infestations of this insect have been discovered during the past summer in five tobacco storage warehouses in the vicinity of Richmond, Va. The insect feeds on the leaf and in addition to this damage the hogsheads receiving even slight infestation are greatly reduced in market value owing to the unsightly appearance of the remaining tobacco. While the area of infestation is small, the possibilities for spread are great. Considerable commercial damage has already been caused by this insect since the contents of the infested warehouses are valued in excess of $9,000,000.

The tobacco crop of the United States is valued at over $250,000,000 annually and occupies an exceptional position as an industry, the product of which returns a direct internal revenue to the Federal Government of about $400,000,000 annually. It is imperative that effective methods of control be developed in order to furnish at an early date remedies which will permit the storing and holding of tobacco without danger of serious losses.

The tobacco moth has been known to feed upon stored cereals and seeds, nutmeats and dried fruits, but with the exception of two reported infestations on tobacco in Russia and England it has never been reported as a tobacco pest. It has not been known as a pest of economic importance upon any stored commodity in the United States until its discovery in tobacco in Virginia. No data on control have been developed which can be applied toward effecting its elimination from the tobacco industry.

(b) The plan of the Department will be:

To develop fumigants which will penetrate tobacco leaf stored in hogsheads and other containers and check the infestation without, or with minimum, damage to the leaf. An effort will be made to determine methods for recognizing the infestations of this insect in the early stages so that control methods may be utilized before heavy damage has resulted. Through cooperation with the Extension Service, information on successful remedies will be transmitted to growers and warehousemen so that necessary precautions may be taken to prevent infestations at the source.

(c) Cooperation:

Part of the laboratory and field work on fumigations will be done in cooperation with the Bureau of Chemistry and Soils, and with the Tobacco Industry, which will provide the warehouse space and product for experimental work when the latter reaches the plant operation scale.

(d) Present work:

Previous to the discovery of this pest in cured tobacco during August, 1930, no work had been done on the tobacco moth in this country. Intensive surveys over a limited area immediately surrounding the infested area, indicate that to date the infestation is confined to the vicinity of Richmond, Va. During September and October, large scale fumigation experiments were started and are still in progress.

(2) $10,000 to enlarge the investigations concerned with the control of the pea weevil in the Pacific Northwest:

(a) The pea weevil is an important limiting factor to the development of the seed pea industry in the Northwest, since the development of a single weevil in a seed destroys its value for seeding and food purposes. Thus far the new seed pea industry has increased rapidly, but individual farmers have already been driven out of the industry by infestation at harvest totaling as high as 97% of the crop. The degree of infestation seems to progress in intensity with continued cropping, and it is now generally admitted that the continued development of the field pea industry is being jeopardized by the pea weevil.

This project is closely linked with the Department's interest in developing the seed pea industry in the Northwest, not only to assure the growers of an added profitable cash crop, but especially to furnish a good supply of seed for winter legumes throughout the South.

(b) The plan of the Department will be:

To make an intensive study of the biology of the pea weevil under varying soil and climatic conditions existing in the seed pea areas of the States of Oregon, Washington and Idaho, with special reference to hibernation studies in and about the fields themselves; to attempt to harmonize present cultural methods which encourage weevil abundance with promising control measures and to develop satisfactory methods for treating peas after they have arrived at the warehouse. Through cooperation with the Extension Service, information on successful remedies will be transmitted to growers and warehousemen.

(c) Cooperation:

The work will be in cooperation with the State Experiment Stations in the affected area at whose request Congress provided funds for starting the investigation. Further cooperation has been offered by warehousemen and by an Association of over 200 pea growers. Office space has already been provided free by the Oregon Agricultural Experiment Station.

(d) Present work:

The work made possible by the 1931 appropriation has been confined to the Willamette Valley with headquarters at Corvallis. The results obtained have been startling and have won the keen interest of officials and pea growers throughout the entire field pea area. To date information has been secured only on certain phases of losses due to field infestation and this has challenged the old time-worn control remedies.

## Activities under Appropriation for Stored Product Insects

The investigation now being conducted under this appropriation relate to, (1) infestations affecting such stored grain as wheat, corn, small grains, and cereal products, including all forms of package cereals, flour, etc., (2) insects attacking dried fruits, (3) weevils affecting beans and peas, (4) insects affecting fabrics, furniture, etc., (5) insects of the household, including bedbugs and cockroaches, (6) the development of general methods for controlling stored product insects, including the utilization of heat, cold and fumigants.

Important activities under this appropriation for which funds were recently allotted include, (a) the control of insects which infest and greatly reduce the value of export flour, (b) clothes moths as pests of fabrics and furniture in warehouses, (c) the control of the pea weevil in the Northwest, (d) the control of insects affecting confections.

## (j) TAXONOMY AND INTERRELATIONS OF INSECTS

| | |
|---|---|
| Appropriation, 1931 | $171,000 |
| Second Deficiency Act 1930 | 50,000 |
| Brookhart Act adjustments | 980 |
| Total, 1931 | 221,980 |
| Budget, 1932 | 184,720 |
| Decrease | 37,260 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase or Decrease |
|---|---|---|---|---|
| Taxonomic Investigations on Beetles | $ 28,067 | $ 28,350 | $28,350 | - - - |
| Taxonomic Investigations on Moths | 18,213 | 68,600 | 24,340 | -44,260 |
| Taxonomic Investigations on Flies | 4,816 | 10,820 | 10,820 | - - - |
| Taxonomic Investigations on Hymenoptera. (parasites & wasps, etc.) | 30,026 | 30,137 | 30,137 | - - - |
| Taxonomic Inves. on Grasshoppers | 5,438 | 5,540 | 5,540 | - - - |
| Taxonomic Inves. on True Bugs | - - - | 4,000 | 4,000 | - - - |
| Taxonomic Inves. on Ectoparasites & mites | 5,207 | 5,270 | 5,270 | - - - |
| Taxonomic Inves. on Scale Insects | 10,958 | 10,960 | 14,160 | + 3,200(2) |
| Bioclimatic Studies of Insects | 8,078 | 8,080 | 8,080 | - - - |
| Morphological Investigations | 9,755 | 9,800 | 9,800 | - - - |
| Exchange of Useful Insects | 10,514 | 10,680 | 10,680 | - - - |
| Insect Pest Survey | 13,654 | 15,003 | 15,003 | - - - |
| Public relations | - - - | 14,740 | 18,540 | + 3,800(3) |
| Totals | $144,726 | $221,980 | $184,720 | -$37,260 |

There is an apparent decrease in this item of $37,260 but taking into consideration the $50,000 for the purchase of the Barnes collection of moths and butterflies which is not included in the estimates for 1932, there is an actual increase in working funds of $12,740.

(1) $5,740 for studies on the classification and identification of the Economic moths known in their larval stages as cutworms and their relatives:

(a) Owing to the existence in this country of a large number of different kinds of cutworm moths, to our very inadequate knowledge of the classification of these moths, and to the large number of demands which come to the Bureau from economic entomologists for information on the classification of cutworm moths, the Bureau has, for several years, been in great need of an entomologist who could devote his entire time to a study of these moths, which family includes approximately one-third of all the moths known to occur in the United States. Many economic pests of outstanding importance belong to the family and the positive differentiation of some of these pests from other species at the present time noninjurious is, with our present knowledge, very difficult and in some cases impossible.

(b) The plan of the Department will be:

To employ a trained specialist to study critically the collections of cutworm moths now accumulated, in order to work out means of recognizing certainly the different kinds which occur in this country, and to supply to the different offices of the Bureau of Entomology, to State entomologists, experiment station entomologists, and others interested in economic problems, accurate information regarding the identities of those cutworm moths which they find to be causing damage to different economic crops.

In addition to the specialist, services of an artist will be obtained to assist in making known, for the benefit of all entomoligcal workers, the knowledge about these moths which will be developed from the studies of the specialist.

(c) Cooperation:

While no formal cooperation with other units of the Department or elsewhere is involved in this work, it consists to a very large degree of cooperative service work for the benefit of other units of the Bureau, of other bureaus in the Department of Agriculture, such as Plant Quarantine and Control Administration, of numerous State organizations, and of others engaged on problems in economic entomology.

(d) Present work:

The Bureau at the present time has no one engaged directly on studies on cutworm moths. It has attempted in the past to meet the frequent demands for information on these particular moths by utilizing part of the time of specialists assigned to other work, but this arrangement has been completely inadequate to the needs of the situation.

(2) $3,200 for investigations on the classification and identification of scale insects:

(a) Studies on the classification of scale insects and service work to many Government departments and many others through supplying identifications for these important economic insects have always been a very important part of the insect classification work of the Bureau. Until recently it has been possible to handle the large volume of work on these insects successfully, but during the last two years most of the available time of the specialist formerly engaged on them has been taken up with supervisory and administrative work in connection with the

Bureau's taxonomic organization. On this account the service and investigational work on scale insects has fallen behind very badly, with resultant serious dissatisfaction and the interruption of the work of many agencies concerned with these insects. The difficulty has been particularly serious in connection with the plant quarantine work of the Department and of the different States, since scale insects are encountered with great frequency in the course of such work, and it is absolutely necessary to have accurate information promptly regarding the different kinds of scale insects discovered.

(b) The plan of the Department will be:

To employ an additional specialist on these insects who will be able to devote his full time to studies on their classification and identification and will in this way be able to meet promptly and adequately demands for assistance which now come to the Bureau.

(c) Cooperation:

As with the preceding project, no formal cooperation is involved, but actually the work is cooperative assistance to nearly all agencies, engaged in economic entomology in this country.

(d) Present work:

The Bureau has attempted to carry on this work under existing handicaps, as pointed out above, but has not been successful in keeping it up to date.

(3) $3,800 to initiate work in carrying information on insect pests to farmers, growers and live stock producers in the New England and Middle Atlantic States.

(a) Much of the loss occasioned by insect pests can be prevented by more thorough adoption by the farmers of practices already known to entomologists. The subject-matter specialist contemplated in this appropriation will visit the extension entomologists in the Middle Atlantic and New England States and carry to them the most recent information of the Bureau of Entomology and carry from one State to another the best methods of getting these practices adopted. The Federal government is expending, under the Smith-Lever Act, $50,542 for Extension Work in Economic Entomology in the United States, and the States are expending an additional $83,752.

(b) The plan of the Department will be:

To appoint one entomologist, who will, through the Office of Cooperative Extension Work and the Extension Directors of the New England and Middle Atlantic States, visit the extension entomologists and confer with them on the improved methods of controlling insects and on the most recent and successful methods of putting on extension campaigns for this purpose.

(c) Cooperation:

The traveling expenses of this man will be borne by the Office of Cooperative Extension Work.

(d) Present work:

At the present time, two extension specialists, in economic entomology, are carrying on similar work, one in the Southern States and one in the East Central States.

Activities under Appropriation for Taxonomy and Interrelations of Insects

The work under this subappropriation deals chiefly with the important basic problems of insect identity and distribution, of the general interrelations among insects and their behavior, and injurious or beneficial habits under varied environmental conditions. It includes also the maintenance of a survey unit which reports from month to month the existence and progress of outbreaks of injurious insects and cooperates with the Extension Service in furnishing to farmers, fruit-growers and livestock producers up-to-date information on insect control. Much of the work of the division is of a highly specialized service character, as it involved the supplying of technical information on the identity and habits of insects to investigators of entomological problems throughout the Federal Service and State organizations, and universities, in this country, to similar investigators throughout the world and to numerous quarantine officials. Continued studies on insect classification are necessary to meet the demands made on this unit in connection with problems which are constantly arising.

## (k) BEE CULTURE AND APIARY MANAGEMENT

| | |
|---|---|
| Appropriation, 1931 ..... | $ 75,000 |
| Brookhart Act adjustments ..... | 420 |
| Total, 1931 ..... | 75,420 |
| Budget, 1932 ..... | 75,420 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Behavior of bees ..... | $ 14,004 | 14,280 | 14,280 | - - - |
| Diseases of bees ..... | 6,297 | 6,300 | 6,300 | - - - |
| Physiology of bees ..... | 5,019 | 5,050 | 5,050 | - - - |
| Regional beekeeping methods .... | 4,303 | 9,910 | 9,910 | - - - |
| Demonstration in beekeeping .... | 3,896 | 4,000 | 4,000 | - - - |
| Intermountain Beekeeping ..... | 10,304 | 10,440 | 10,440 | - - - |
| Beekeeping in Southern States .. | 10,180 | 10,440 | 10,440 | - - - |
| Beekeeping in Pacific States ... | - - - | 15,000 | 15,000 | - - - |
| Totals ..... | 54,003 | 75,420 | 75,420 | - - - |

### Activities under this Appropriation

The work under this appropriation is concerned with investigations of basic and apiary management, designed to make the production of honey more profitable to the beekeeper, and with research on the function of bees in the pollination of plants. Much valuable work is done each year and this has greatly added in stabilizing the beekeeping industry.

Specific lines of work which have been of particular interest recently include (a) organization of the beekeeping laboratory in the Southern States (b) investigations relating to the handling of honey in the apiary in order to prepare it for market (c) research on beekeeping in the Pacific States.

- - - -0- - - -

# BUREAU OF BIOLOGICAL SURVEY

## (a) Administrative Expenses

| | |
|---|---|
| Appropriation, 1931 | $77,520 |
| Brookhart Act adjustments | 1,304 |
| Total, 1931 | 78,824 |
| Budget, 1932 | 83,620 |
| Increase | 4,796 |

### Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase W.F. | Increase U.A.S. |
|---|---|---|---|---|---|
| General administrative expenses | $73,271 | $78,824 | $83,620 | $4,456(1) | $340 |

The increase of $4,796 is submitted for the following purposes:

$340 Under-average Salary Grade Adjustments.

$4,456 increase in working funds, as follows:

(1) $4,440 for two additional clerical employees at $1620 each and one laborer at $1200.

An additional bookkeeper is required in the accounting office of the bureau to meet the increase in accounting work incident to steady growth of the bureau's activities and the addition of new units. The stage has been reached where much overtime is necessary to keep up with the increased work, especially in the bookkeeping section. During the first nine months of the current calendar year employees in this office put in 441 hours of overtime. Accounts handled in 1930 exceeded those handled in 1929 by 10 per cent, and an even larger increase for 1931 over 1930 is anticipated on the basis of increased funds, amounting to $286,000. The need for this bookkeeper in 1932 will be imperative, irrespective of any increase in the 1932 appropriations.

An additional stenographer is needed to handle increased work in the business operations office due to the growth of the bureau. At present help has to be obtained almost daily through borrowing clerks from the various divisions. Much overtime is now required in keeping up the work in this office, and records which should be kept are not now available as there is no one who can maintain them.

A laborer is needed in the supply section of the bureau. There is an increasing amount of heavy work in connection with the handling of supplies, the packing and unpacking, crating and shipment of heavy boxes, the shifting of furniture and other similar work. The expanding field organization, due largely to new lines of work authorized by Congress, has greatly increased

the number and extent of shipments of supplies to the field, and the increase is still continuing. It has been necessary in the past to depend upon the messenger force for much of this work, but it has become so extensive that it is a considerable interference with their regular duties. Further, it is work that they should not be required to perform, being heavy, laborer's work.

Activities under Appropriation for Administrative Expenses

The work now conducted under this appropriation relates to (1) general administration under the chief and associate chief of bureau, (2) business operations, including the handling of personnel and budget matters, the office of accounts, property section, mails and files, including messenger force, and the char-force, (3) editorial office, and (4) office of exhibits, photographs, and publications distribution.

## (b) MAINTENANCE OF MAMMAL AND BIRD RESERVATIONS

Explanation of change in language: The insertion of the clause "and section 10 of the Migratory Bird Conservation Act of February 18, 1929 (45 Stat., p. 1222)" is recommended as the section referred to provides for protecting property and wild life on game refuges and bird reservations. The elimination of the wording at end of item for purchase of land is recommended as the land will be acquired during the current fiscal year.

| | |
|---|---|
| Appropriation, 1931 | $80,000 |
| Brookhart Act adjustments | 360 |
| Total, 1931 | 80,360 |
| Budget, 1932 | 88,330 |
| Increase | 7,970 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase or Decrease |
|---|---|---|---|---|
| Bird Refuges | $13,609 | $19,903 | $28,953 | $9,050 (2-3) |
| National Bison Range (Mont.) | 21,637 | 15,049 | 14,349 | - 700 (1) |
| Wind Cave Game Preserve (S.D.) | 9,325 | 9,437 | 12,437 | 3,000 (4) |
| Elk Refuge (Wyo.) | 18,854 | 20,572 | 19,572 | - 1,000 (1) |
| Sullys Hill Game Preserve (N.D.) | 5,917 | 5,686 | 5,686 | - |
| Niobrara Reservation (Nebr.) | 5,567 | 8,713 | 6,333 | - 2,380 (1) |
| Restocking Reservations | 12 | 1,000 | 1,000 | - |
| Totals | $74,921 | $80,360 | $88,330 | $ 7,970 |

There is a net increase of $7,970 in this item. This involves decreases of non-recurring items totalling $4,080, and three increases in working funds totalling $12,050, as follows:

(1) $4,080 decrease due to dropping the following non-recurring items:
$700 for the purchase of land on the National Bison Range;
$1,000 for the construction of a barn on the Elk Refuge; and
$2,380 for the construction of corrals and a slaughterhouse on the Niobrara Reservation.

(2) $2,650 for surveying and posting 26 bird refuges:

(a) Adequate posting of reservations is one of the most effective means of preventing unintentional trespass on these areas set aside for the conservation of bird life. Proper posting also serves as an educational feature in connection with conservation by appraising the public of the character and extent of this form of conservation work. These 26 refuges have never been posted except in a few instances where they have been posted only in part, and as no warden service is maintained the public now has no means of knowing that they are protected areas. Surveying work will be necessary in many cases to determine the boundaries before posting can be done.

(b) The plan of the Department will be:

To employ regular or temporary employees to the greatest possible extent to survey and post the reservations, thereby reducing to the minimum the cost of this work. It is estimated that through this method the average cost per reservation can be held down to about $100.

(3) $6,400 for temporary warden service on 16 bird refuges, and full time service on Tule Lake, Clear Lake and Upper Klamath Lake.

(a) There is a great need for temporary warden service during the breeding season on many of the bird reservations which now have no protection and 16 of the more important are located in Arizona, Florida, Louisiana, New Mexico, Nebraska, Nevada, Oklahoma, Oregon, Utah, Washington, and Wyoming. These areas have been set aside as sanctuaries for birds but with no provision for their proper protection, and until such protection is afforded they will not be serving their intended purpose as they should.

There is also urgent need for a full time warden on Tule Lake and Clear Lake in California and Upper Klamath Lake in Oregon where only part time service is now possible with present funds. Many complaints of violations and trespass on these unguarded reservations have been received and the protection which will be offered by the employment of this warden will be of great value in conserving the wild life on the areas in making them serve the purpose for which created.

(b) The plan of the Department will be:

To provide warden service at the several reservations during the times the areas are used by the birds for breeding purposes, or as feeding and resting places during their migrations thus making them inviolate sanctuaries for the birds. The Tule, Clear and Upper Klamath Lakes reservations are important breeding, feeding, and resting areas that require full time service of a warden for their adequate protection.

(c) Present work:

Permanent warden service is now maintained on the Tampa Bay, Florida group of three reservations; the Hawaiian Island Reservation; at Big Lake, Arkansas, and Lake Malheur, Oregon. Temporary warden service is maintained at Belle Fourche, South Dakota; Dungeness Spit, Washington; Tortugas Keys, Florida; Savannah River, South Carolina; Deer Flat, Idaho; and cooperative warden service through employees of the Reclamation Service at 12 reservations on Reclamation Projects; and one reservation is given warden service by an employee of the Bureau of Animal Industry. The remaining 58 wild life refuges which have been set aside by executive order for the protection of bird life are now unprotected.

(4) $3,000 for altering the game fence on Wind Cave Game Preserve:

The building of the fence contemplated under this item is a necessary improvement to facilitate the handling of the buffalo and other big game animals and the administration of this reservation. The improvement involves the construction of 1 1/4 miles of big game fence and 2 1/4 miles of stock fence in the northwest big game pasture. This will provide forage for administrative stock and will result in a $500 annual saving now expended for that purpose. By the construction of the stock fence 115 acres of land within the boundaries of the Wind Cave National Park, but outside the present big game fence, will be reclaimed for use. By inclosing this area considerable trespass will be eliminated from the Park area and this is very desirable from the standpoint of the National Park Service officials.

The new big game fence will be constructed before the present irregular boundary fence is removed. Much of the material in the old fence will be salvaged and used for the necessary repairs and construction of capturing wings and holding corrals for the proper handling of the big game at the reservation.

Two big game pastures are maintained on this preserve; the west pasture of approximately 4,000 acres, and the east pasture of approximately 3,000 acres. The animals on the reservation total 152 buffalo, 28 elk, and 29 antelope. The maintenance of the two pastures allows the grazing to be rotated and the condition of the range to be maintained at the highest possible standard.

During the past fiscal year a surplus of 61 buffalo were removed from the Preserve; five of these animals were gifts to city parks and zoos, and 10 were furnished to the States of Arizona and South Dakota, under cooperative stocking agreements for the return of the original number of animals upon demand of the Federal government. The sale of 46 buffalo produced a revenue of $1,785. Twenty-five elk were also disposed of from this preserve and produced a revenue of $1,607.75 - making a total of $3,392.75 realized on the disposal of surplus animals from this reservation.

The gift of buffalo under the existing law to State, city and municipal parks and zoos or other institutions of that nature provides exhibition animals of educational interest to the general public and the cooperation with State authorities in the establishment of new herds is of great value in the preservation of big game animals in widely separated herds.

Activities under Appropriation for Maintenance of Mammal and Bird Reservations

The activities now being conducted under this appropriation relate to (1) the maintenance of 5 big game refuges--Niobrara Reservation, Valentine, Nebr., Wind Cave Game Preserve, Hot Springs, S. Dak., Elk Refuge, Jackson, Wyo., Sullys Hill Game Preserve, Fort Totten, N. Dak., National Bison Range, Moiese, Mont., (2) the protecting of birds through warden service and posting of notices against trespassing on 80 reservations set aside by executive order for the protection of birds, (3) the restocking of national reservations.

## (c) FOOD HABITS OF BIRDS AND ANIMALS

Explanation of change in language: The language eliminated in this item after the semicolon is included in a new item submitted for 1932 entitled "Control of Predatory Animals and Injurious Rodents." The elimination of this language and also of the word "other" and the insertion of the wording and economic value and including methods of conserving beneficial and controlling injurious birds and animals is recommended in order that the appropriation for research work in this field may be segregated rather than included with another line of work largely unrelated to it, and further that the wording may be clarified and made to better describe the work as it is now being conducted.

| | |
|---|---|
| Appropriation, 1931 | $99,700 * |
| Brookhart Act adjustments | 660 |
| Total, 1931 | 100,360 |
| Budget, 1932 | 107,660 |
| Increase | 7,300 |

*$574,150 submitted for 1932 under "Control of Predatory Animals and Injurious Rodents" and $6,150 submitted for 1932 under "Biological Investigations" are also part of this appropriation in 1931.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Control Methods Research..... | $34,937 | $34,700 | $34,700 | |
| Relation of Native and Introduced Birds and Other Animals to Agriculture..... | 50,590 | 65,660 | 72,960 | $7,300 |
| Totals ..... | $85,527 | $100,360 | $107,660 | $7,300 |

The increase of $7,300 is submitted for the study of the food habits of predatory animals:

(a) Very few detailed laboratory analyses of the stomach contents of predatory animals have been made, a fact that has embarrassed the Biological Survey in replying to critics of the campaigns for the control of these animals as provided for in the annual appropriation bills since 1914. Control operations against injurious animals should be based upon as complete understanding as possible of their relations to other forms of life and the detailed information on the food habits of predatory animals which we may expect from the proposed investigation will give us an adequate basis on which to decide the best policy to be adopted in the case of each of the animals to be investigated.

(b) The plan of the Department will be:

To establish a laboratory in the West in close contact with field operations from which source the material for the studies will be furnished. With the amount estimated, it will be possible to pay the salaries and expenses of two investigators whose work will be supervised by an employee detailed from the Washington office.

Activities under Appropriation "Food Habits of Birds and Animals"

The investigations under this appropriation relate to (1) the agricultural significance of native and introduced birds and to a lesser degree of other land vertebrates; (2) improvement of methods and dissemination of knowledge thereof in the protection and increase of useful species and the control of injurious ones; (3) study of maladies of birds arising from their food habits; (4) study of the food resources of birds together with possibilities of improvement; (5) study of the method of propagation of game birds and the care of cage and ornamental birds and dissemination of information on these topics.

## (d) CONTROL OF PREDATORY ANIMALS AND INJURIOUS RODENTS

Explanation of change in language: This new item, consisting of language eliminated from the appropriation "Food Habits of Birds and Animals" with changes therein, is recommended as a separate item of appropriation since it involves eradication and control work. The language of the item pertaining to this work as heretofore carried in the bill has been obscure through being combined with the language pertaining to the research work which appears first and bears the appropriation heading. The language has been somewhat changed making it less restricted and providing for the suppression of other diseases among predatory animals than rabies.

| | |
|---|---|
| Appropriation, 1931 | $574,150 * |
| Brookhart Act adjustments | 4,300 |
| Total, 1931 | 578,450 |
| Budget, 1932 | 590,480 |
| Increase | 12,030 |

* Heretofore, and during the fiscal year 1931 this work has been conducted under the sub-appropriation "Food Habits of Birds and Animals". It is submitted as a separate item for 1932, in order to clarify the appropriation arrangement.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Control of injurious rodents | $208,147 | $238,672 | $250,702 | $12,030 |
| Control of predatory animals | 327,345 | 339,778 | 339,778 | - |
| Totals | $ 535,492 | $ 578,450 | $590,480 | $12,030 |

The increase of $12,030 is submitted for control of injurious rodents:

(a) There is need for organized systematic control of rats, field and house mice, woodchucks and other injurious rodents in states east of the Mississippi River, in which it is not now possible for the Bureau to carry on operations with the funds now available. Many requests have been received from these states asking for assistance because of the serious damage done to growing and stored agricultural products.

A recent comprehensive Survey shows that there are more than 8,000,000 acres of National Forest lands infested by ground squirrels and prairie dogs where the carrying capacity for stock grazing is being reduced at least 25 per cent because of the depredations of these rodents. Present appropriations allow treatment of only a small part of the infested lands. The increase will be of some assistance in handling the most urgent cases making the areas treated more valuable for grazing purposes and a greater asset to the Government.

Agencies other than the Government are contributing more than five times as much as the Government in financing organized rodent control operations conducted under the supervision of the Bureau. This increase will enable the Bureau to more fully meet its share of the cooperative work, and some of the more important demands.

(b) The plan of the Department will be:

To place an experienced leader in charge of a district of one or more States in the East not now receiving Federal aid, to demonstrate scientific methods of controlling injurious rodent pests, to organize systematic control campaigns, and to coordinate private, city, county, and State agencies now conducting similar endeavors.

To increase the rodent control operations on public lands in the interest of increased forage, the prevention of erosion, and the protection of deeded lands adjoining forest areas which have been previously cleared of the pests and are being reinfested by rodents on public lands.

(c) Cooperation:

Cooperation in the Eastern States will be with the Extension Service, Agricultural Colleges, counties, cities and individuals. During the fiscal year 1930, cooperators in these States contributed $25,695 to campaigns while the Federal Government spent $22,332. The proportion of cooperative funds to Federal funds will no doubt increase as the work develops.

In the Western States, cooperation will be with the Indian Office, Forest Service, Extension Service, State Boards of Agriculture, counties, associations, and individuals. During the fiscal year of 1930, cooperating agencies spent $893,299 on rodent control operations, while the Federal Government spent $174,288, in these field operations.

(d) Present work:

Rodent control operations under present appropriations are being conducted in 14 States west of the Mississippi River and in 13 of the Eastern States. The demands for increased work can not be met with present appropriations. The fact that cooperators contribute over five times the funds supplied by the Federal Government indicates the demand for the work. The above increase will assist in partially meeting this demand.

## Activities under Appropriation for the Control of Predatory Animals and Injurious Rodents

The work under this appropriation deals with the control of injurious rodents and predatory animals that are a serious menace to livestock, poultry, wild game, grazing lands, farm crops, fruit and forest trees, and stored agricultural products, as well as public health. The work accomplished under the appropriation has been of great importance in making farming and livestock growing more profitable.

## (e) PRODUCTION OF FUR-BEARING ANIMALS

| | |
|---|---|
| Appropriation, 1931 | $59,000 |
| Brookhart Act adjustments | 360 |
| Total, 1931 | 59,360 |
| Budget, 1932 | 64,360 |
| Increase | 5,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Investigations of fur animals... | $12,460 | $16,460 | $16,460 | - - |
| Diseases of fur animals..... | 10,950 | 12,500 | 12,500 | - - |
| Fur-animal experiment station (New York)..... | 14,292 | 14,700 | 14,700 | - - |
| Rabbit experiment station (California)..... | 13,175 | 15,700 | 20,700 | $5,000 |
| Totals | $50,877 | $59,360 | $64,360 | $5,000 |

The increase of $5,000 is submitted for the study of rabbit diseases:

(a) New diseases have made their appearance near the Rabbit Experiment Station at Fontana, California. The Department is not in position to advise definitely regarding the treatment and control of diseases and parasites because no remedies are known for "snuffles" or "bloat," the so-called diseases with which most of the rabbits are affected. Severe losses have been encountered among rabbit breeders. The decrease of animals in the California area has been such that the consumption of rabbit meat in Los Angeles is only 40 per cent of the volume it was a year ago and many extensive producers have been forced out of business.

(b) The plan of the Department will be:

To establish and equip a laboratory at the Experiment Station, for studying (1) the diseases of rabbits with a view to developing control measures; (2) the effects of different methods of feeding and management in relation to controlling or preventing the diseases; and employing temporary labor to supplement the regular staff of employees.

(c) Cooperation:

A cooperative working agreement between the University of Southern California, at Los Angeles, and this Department has been effective since August, 1929. That institution has furnished space in one of its buildings for a laboratory and isolation rooms for diseased rabbits.

(d) Present work:

The Department is expending $2,400 during the present fiscal year for the salary of a bacteriologist and is supplying most of the necessary animals. The work undertaken at the University of Southern California has thus far failed to develop satisfactory methods of control or prevention, and several preliminary experiments to study the effects of different methods of feeding and management in relation to preventing and controlling the diseases have been undertaken by the Department at the Rabbit Experiment Station. So far, however, none of the work has given the desired results, although there are many indications that benefits might be obtained in this way.

## Activities under Appropriation for Production of Fur-Bearing Animals

The investigations now being conducted under this appropriation relate to (1) studying the production and economic methods of raising fur animals in captivity under wild and semi-wild condtions, and the utilization of fur with a view to maintaining an adequate supply, and ascertaining production conditions under which various species can be raised profitably; (2) studying diseases of foxes in cooperation with the University of Minnesota, and conducting research work in laboratories to determine causes and methods of control; (3) operating a Fur-Animal Experiment Station, at Saratoga Springs, N. Y., to determine the most satisfactory method of raising fur animals in captivity, such as ascertaining conditions under which the various species can be raised profitably and produce good fur, developing improved strains of promising species by selective breeding, and learning the breeding, gestation, whelping, and prime-fur periods; and (4) operating a Rabbit Experiment Station, at Fontana, California, to determine the best methods of producing rabbits for food and fur, studying the best methods of feeding, breeding, housing, killing, pelting, and preparation of skins and carcasses for market, and sanitation.

Specific lines of work which have been of particular interest recently include (1) the determination of a definite breeding and gestation period of martens; (2) the intensive study of two devastating diseases of silver foxes which led to the development of important information of value to fur farmers; (3) the discovery of new facts in the crossing of various strains of silver and red foxes; and (4) the increased production and quality of fur by the introduction of new feeds and combination of feeds in the ration.

## (f) BIOLOGICAL INVESTIGATIONS

Transfer of project: The project "Investigations of Injurious Animals" is recommended for transfer from the appropriation "Food Habits of Birds and Animals" to this appropriation as the work is now carried on by the Division of Biological Investigations and is more in line with its activities than with those under the other appropriation item. Reduction of the amount of the project has been made from the appropriation for "Food Habits of Birds and Animals."

| | |
|---|---|
| Appropriation, 1931..... | $66,800 |
| Project: Investigations of Injurious Animals..... | 6,150 * |
| Brookhart Act adjustments..... | 310 |
| Total, 1931..... | 73,260 |
| Budget, 1932..... | 83,110 |
| Increase..... | 9,850 |

*Part of "Food Habits of Birds and Animals" in 1931, but transfer to this appropriation proposed in Budget, 1932.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase | |
|---|---|---|---|---|---|
| Investigations of Injurious Animals..... | $ 6,650 | $ 6,150 | $ 6,150 | - | |
| Investigations of Wild Animal Life..... | 51,243 | 49,110 | 52,060 | 2,950 | (1) |
| Research in Forest Wild Life. | 7,824 | 18,000 | 24,900 | 6,900 | (2) |
| Totals..... | $65,717 | $73,260 | $83,110 | $9,850 | |

The increase of $9,850 is submitted for the following purposes:

(1) $2,950 for laboratory investigations and work upon the identification and distribution of birds and mammals.

(a) The collections now include over 200,000 mammal and 65,000 bird specimens. Additions of new specimens are constantly being received from field employees engaged in scientific, regulatory, or control work which require identification as a basis for efficient conduct of the Bureau's work. A vast amount of data has been accumulated during the past and is constantly augmented by field and laboratory investigations which require digesting and preparation for publication. This is urgently needed for guidance of the Bureau in its own work and for information of the public. The wild life of the country represents a natural asset of incalculable value, but includes destructive agencies which cause enormous losses to agriculture. Reliable information and exact determination of species involved is essential to efficient administration.

(b) The plan of the Department will be:

With the additional assistance which will be provided with this increase to prosecute effectively work to make available accurate identification and reliable information to guide the Bureau and all other agencies concerned with administration of wild life resources including control, conservation, and use.

(c) Cooperation:

Specimens are borrowed and loaned and work is done in collaboration with specialists in scientific and educational institutions throughout the country.

(d) Present work:

Consists in the care of collections, their use in scientific work, identification of specimens of species involved in scientific, control, and regulatory work, and preparation for publication of material needed for scientific, educational, and administrative purposes.

(2) $6,900 for forest and wild life research authorized by the McSweeney-McNary Forest Research Act.

(a) This is to carry forward the program of research on the relation of wild life to forests as authorized by the McSweeney-McNary Forest Research Act (45 Stat. 699, Chapter 678). The problems include determination of possibilities for production on forest lands of valuable species of game and fur-bearing animals, and investigation of beneficial or harmful relationships of these and other forms to forest production. Destructive activities of rodents or predatory birds and other animals and compensating beneficial habits are being studied. The relation of sapsuckers, and of woodpeckers, or other birds, of bats, shrews, mice, and other animals, which feed upon destructive forest insects or plant parasites, the value of birds and mamals as distributors of seeds of forest trees, and their possible agency in destroying or distributing plant diseases are also carefully investigated.

(b) The plan of the Department will be:

To detail trained investigators to the various Forest Experiment Stations to conduct field and laboratory investigations and experiments designed to provide reliable information essential for intelligent forest and wild life administration.

(c) Cooperation:

The field and laboratory work will be conducted in cooperation with the Forest Service, which is requesting various items of increase in the 1932 Budget for more or less related activities under the appropriations for forest and range research.

(d) Present work:

Four investigators are now employed on this work, being detailed to the Appalachian Forest Experiment Station, the Lake States Forest Experiment Station, the Intermountain Forest and Range Experiment Station, and the Northeastern Forest Experiment Station. The work has been in progress less than a year but has been carefully planned and organized and much valuable data already secured regarding occurrence, distribution, abundance, and habits of forest inhabiting species, on their economic relationships, and in some instances the need for efficient methods of control.

Activities under the Appropriation "Biological Investigations"

Work under this appropriation includes the basic scientific work of the Department on the classification, life history, habits, distribution, migration, and other activities of mamals, birds, and other vertebrate animals, and of conditions affecting their welfare. Biological surveys are made of special areas, with a view to building up a sound body of knowledge regarding wild life conditions throughout the country. Studies are being made of wild life on reservation areas such as that recently completed covering the Upper Mississippi River Wild Life Refuge. It includes also the program of research upon wild life in relation to forestry production authorized by the McSweeney-McNary Act. Four investigators have already been assigned to work upon the problems in this important field.

Special studies are also in progress relative to big game animals and conditions which affect their welfare as with deer on the Kaibab and Pisgah National Forests and in Pennsylvania, and the elk and moose of the Jackson Hole and Yellowstone regions.

## (g) PROTECTION OF MIGRATORY BIRDS

| | |
|---|---|
| Appropriation, 1931..... | $192,000 |
| Brookhart Act adjustments..... | 1,255 |
| Total, 1931..... | 193,255 |
| Budget, 1932..... | 220,120 |
| Increase..... | 26,865 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Migratory Bird Treaty Act.. | $133,771 | $147,937 | $164,802 | $16,865 |
| Investigations of Migratory Birds..... | 20,220 | 25,667 | 35,667 | 10,000 |
| Lacey Act..... | 18,722 | 19,651 | 19,651 | - |
| Totals | $172,713 | $193,255 | $220,120 | $26,865 |

There is a net, or apparent increase of $26,865, but an actual increase of $36,865 in this appropriation due to dropping a 1931 non-recurring item of $10,000 for the purchase of a boat.

The increase of $36,865 is needed for the following purposes:

(1) $26,865 for more adequate enforcement of the Migratory Bird Treaty Act.

(a) Violations of the Migratory Bird Treaty Act regulations are occurring in such numbers that it is utterly impossible to enforce the law with the present force of the U. S. Game Protectors--25 for the entire United States. The difficultues to which the enforcement of this law is subjected have been increased manyfold due to the fact that the daily bag limits on wild ducks and geese has been reduced from 25 to 15 and 8 to 4 respectively. Funds sufficient to enable the Government to cope successfully with the large element of hunters who deliberately violate the law by shooting excessive bag limits, hunting at night, shooting from motorboats, and using various other illegal methods are urgently needed. That it is the duty of the Government to adequately enforce the Migratory Bird Treaty Act in order to keep faith with Canada under the Treaty entered into with Great Britain in 1916 cannot be disputed. It is a very necessary and vital part of the Government's conservation program to give protection which will result in augmenting the supply of our migratory game birds which provide sport and recreation as well as food.

A serious situation faces the wild fowl of this country. The apparent decrease in the number of wild ducks and geese, resulting in the reduction of the bag limit effective this season, has been intensified as a result of the extensive drought conditions in the United States and Canada during the past year. The hatch of ducks in the north last spring and summer, according to reliable information, was far below normal. Due to the drying up of small lakes and other bodies of water frequented by waterfowl throughout the country, there are bound to be considerably larger concentrations of the birds on the remaining areas. Such concentration will greatly increase

the opportunities for game law violators to kill excessive numbers of birds and in order to reduce losses from such sources an increase in the Game Protector personnel is imperative.

(b) The plan of the Department will be:

To add to the present force of U. S. Game Protectors five additional men and to employ one inspector to assist in coordinating and facilitating the work of the protectors. These men will be assigned to districts where the need for additional protection to the birds is most apparent.

(c) Cooperation:

Cooperation is maintained with Federal and State officials interested in the conservation of wild life, sportsmen's associations, wild life protective organizations, and individuals.

(d) Present work:

The Department is enforcing the Migratory Bird Treaty Act and regulations so far as possible with 25 full-time U. S. Game Protectors and the employment for temporary periods from time to time of U. S. deputy game wardens who are paid when actually employed and who work in sections where emergencies exist. The districts of some of the game protectors include two or more States or parts of two or more States. It is manifestly a physical impossibility for one man to see that the law is efficiently enforced over so large an area.

(2) $10,000 for a survey of migratory game birds:

(a) Migratory game birds represent a natural asset worth many millions of dollars for food and recreation. Reliable and comprehensive information is required to enable the Department to discharge efficiently its responsibilities under the Migratory Bird Treaty Act and to carry on educational or informational work to enlist intelligent interest and cooperation on the part of public and private agencies in efforts to conserve and utilize advantageously this important resource.

(b) The plan of the Department will be:

To detail trained investigators to make thorough field studies of conditions affecting migratory game birds on their breeding, feeding, and wintering grounds or waters, and during their migratory flights. Investigations will include numbers and distribution, the effects of weather, floods, drought, and natural enemies or diseases, success during breeding seasons in hatching and rearing broods, causes of mortality, and the relation of abundance to shooting which may be permitted under the Department regulations.

(c) Cooperation:

Assistance of State Game Departments and scientific agencies as well as of individuals will be enlisted so far as practicable in assembling reliable information regarding conditions in the United States and arrangements will be made with Canadian officials to secure comparable data regarding conditions in Canada which affect the number of game birds migrating into the United States.

(d) Present work:

The closely related work in securing information regarding migratory movements and habits of migratory game birds through employment of trapping and banding methods is yielding exact data which has proved of the utmost help in deciding upon hunting regulations and in selecting areas suitable for sanctuary purposes, while the system of seasonal reports from selected cooperators throughout the country is furnishing much data regarding waterfowl conditions. Analysis, checking, and supplementing this data by trained field observers, however, are essential to meet requirements for information to be used for educational and administrative purposes.

Activities under Appropriation for Protection of Migratory Birds

The activities now being conducted under this appropriation include (1) the apprehension and arrest of violators of the Migratory Bird Treaty Act regulations, (2) assembling of evidence for prosecution, (3) education of the shooting public to respect the game laws through the medium of bulletins and pamphlets, public addresses, radio talks, and personal contact, (4) investigations necessary to be conducted with all of the above activities, (5) cooperation constantly being rendered by the U. S. Game Protectors to the various States in connection with the enforcement of State game laws protection birds, fish, and game animals.

## (h) REINDEER, GAME AND FUR-BEARERS IN ALASKA

Explanation of change in language: The insertion of the words "and of" before the word "muskoxen" and "and mountain sheep" thereafter is recommended in order that investigations may be undertaken of the possibility of domestication of mountain sheep. A change is also recommended in the proviso at end of item, so as to increase the authorized expenditure from $3,000 to $4,000 and to authorize either the purchase or construction of buildings for offices and quarters for use of wardens in Alaska. Reference to Ft. Yukon is eliminated. The purpose of the changes is to permit of constructing either offices or quarters at any of the wardens' headquarters to meet the need for such buildings. Aside from Ft. Yukon there is need for buildings at the present time at Kenai, and Holy Cross where it is difficult to secure desirable space for offices or living quarters. The business-like methods employed by its wardens is an important factor in establishing and maintaining the prestige of the Alaska Game Commission in outlying communities. For this reason it is desirable in many cases to establish offices for wardens separate from the wardens' home.

| | |
|---|---|
| Appropriation, 1931 ..... | $167,000 |
| Brookhart Act adjustments ..... | 410 |
| Total, 1931 ..... | 167,410 |
| Budget, 1932 ..... | 155,650 |
| Decrease ..... | 11,760 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase or Decrease |
|---|---|---|---|---|
| Reindeer Industry in Alaska ..... | $ 23,709 | $ 26,705 | $ 26,705 | ------ |
| Muskox Investigations ..... | ---- | 40,000 | 18,000 | - 22,000(1) |
| Mountain Sheep Investigations .... | ---- | ---- | 500 | + 500(2) |
| Protection of Game and Land Fur-bearing Animals in Alaska ..... | 76,408 | 100,705 | 110,445 | + 9,740(3) |
| Totals ..... | $ 100,117 | $ 167,410 | $ 155,650 | $ - 11,760 |

While there is a net, or apparent decrease of $11,760, due to a non-recurring item of $22,000, there is an actual increase of $10,240 in this item, as follows:

(1) $22,000 decrease due to a reduction of the project "Muskox Investigations" from $40,000 to $18,000:

As the purchase of the muskoxen will be completed in 1931 $18,000 is considered sufficient for the maintenance of the project in 1932. The $18,000 is required for caring for the muskoxen and conducting studies and experiments connected with their introduction, breeding, feeding and handling and for construction of additional fencing, purchase of feed and other supplies, laboratory and other equipment and for miscellaneous items.

(2) $500 increase for mountain sheep investigations:

(a) The wild mountain sheep of Alaska show excellent prospects for successful domestication and production as a source of meat and hides. Five animals now being studied in an experiment conducted in cooperation with the Alaska College of Agriculture and School of Mines have tamed readily, are thriving on food which is produced in great quantities in Alaska, and have bred successfully although kept in captivity. The hides of these animals are of excellent quality for leather manufacture and the meat is of excellent quality and flavor. They offer an opportunity to bring under domestication animals which thrive on natural feeds produced in this region, and under the rigorous weather conditions which prevail. Development of stable sources of meat supply from animals which utilize natural forage and agricultural crops produced in Alaska is essential to the economic and social development of the Territory.

(b) The plan of the Department will be:

To conduct experiments in feeding, breeding, handling, and domestication of mountain sheep with a view to their production on locally raised feed as a source of valuable meat and hides.

(c) Cooperation:

With the Alaska College of Agriculture and School of Mines, which is contributing about an equivalent amount toward the maintenance of the animals now being kept.

(d) Present work:

This experiment can be conducted readily at the experiment station where reindeer and caribou are now under experimental investigation and where a herd of thirty-four muskoxen is now being established. The experiments with mountain sheep can be conducted by the same personnel on lands already set aside at practically no additional cost except for feed and necessary shelter.

(3) $9,740 increase for the enforcement of the Alaska Game Law:

The enforcement of the Alaska game law and regulations protecting game and land fur-bearing animals in Alaska is now being administered by the Alaska Game Commission through ten warden districts with wardens in charge of each district, having headquarters at Juneau, Ketchikan, Cordova, Kenai, Kodiak, Bethel, Anchorage, Fort Yukon, Fairbanks, and Holy Cross. Additional funds to cover patrolling expenses are badly needed in all these districts where wardens are able to spend only from 60 to 75 per cent of their time in the field due to the high cost of transportation. The large part of the territory to be patrolled

can be reached only by dog-team, boat, or airplane which are costly means of transportation. Because of the lack of government-owned boats at several points where boat transportation is the only means which can be used it is necessary to charter boats at high rentals. The increasing use of commercial planes by hunters to reach the rich fur regions makes it imperative that the districts be patrolled as extensively as possible and that airplanes be employed at times as the only means of reaching these areas and effectively patrolling them. With the present funds many sections are now almost inaccessible or can be reached only at rare intervals.

The game and fur animals are some of Alaska's most valuable and necessary assets and as great effort as possible should be expended in preserving them from possible extinction.

Three new warden districts were added in the fiscal year 1931 to the seven previously maintained, for the purpose of more adequately enforcing the Alaska game laws and regulations. These wardens with the use of boats where available and such other equipment and assistance as has been provided them are covering their territory as frequently as their allotment of funds permit. The boat equipment which is now available consists of the seagoing boat "Seal" used in patrolling the coastal regions and outlying islands; the "Sea Otter" operating in the protected waterways of southeastern Alaska; the "Beaver" now on the Upper Yukon but little used because of lack of funds for its operation; and the Kuskokwim River cruiser, a small craft of much value in patrolling areas along this river. In addition poling boats have been supplied the wardens on the Upper and Lower Yukon. During past years more than 40,000 miles have been covered by the wardens in patrolling their districts.

The revenue derived from the sale of licenses, from fines and sales of condemned and forfeited furs, guns, etc. has increased from $19,323 during the first year's operations to $60,248 for the fiscal year 1930. This revenue is, in accordance with the provisions of the Act, divided equally between the school fund of the Territory and the Federal Treasury.

## Activities under Appropriation for Reindeer, Game and Fur-Bearers in Alaska

The activities now being conducted under the appropriation relate to (1) investigations and experiments for improvement of the reindeer industry, and the introduction of muskoxen; (2) the enforcement of the Alaska Game Law and regulations thereunder protecting game and land fur-bearing animals in the Territory.

### (i) UPPER MISSISSIPPI RIVER WILD LIFE REFUGE

| | |
|---|---|
| Appropriation, 1931 | $197,000 |
| Brookhart Act adjustments | 235 |
| Total, 1931 | 197,235 |
| Budget, 1932 | 197,780 |
| Increase | 545 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Administration ..... | $ 39,933 | $ 47,235 | $ 47,780 | $ 545 |
| Acquisition of land ..... | 150,000 | 150,000 | 150,000 | --- |
| Totals ..... | $189,933 | $ 197,235 | $197,780 | $ 545 |

The increase of $545 is for general maintenance expenses of the Upper Mississippi Wild Life Refuge, especially for posting lands and the maintenance of adequate patrol service on the Refuge. The proper patrolling of such a large area involves the maintenance of both land and water equipment for the protection of wild life and for the elimination of fire menaces and the control of fire hazards. As additional lands are acquired it is necessary that these be promptly posted so that the public may be aware that they are a part of the government refuge.

The plan of the Department will be:

To purchase signs and have newly acquired land posted by Reservation Rangers. To hire additional Deputy Reservation Rangers to assist in patrolling the refuge during the hunting season and at times when the fire hazard is greatest.

Cooperation:

Private individuals have cooperated to the extent of donations comprising 1,650 acres of land as additions to the refuge. Cooperation is maintained with the Department of Commerce and the Game Departments of Minnesota, Wisconsin, Illinois, and Iowa.

Activities under Appropriation "Upper Mississippi River Wild Life Refuge"

Under the Act of June 7, 1924 the establishment was authorized of a wild life and fish refuge in the overflow area along the Mississippi River between Wabasha, Minnesota, and Rock Island, Illinois, a distance of approximately 300 miles. Of the 140,000 acres of suitable land for this project, 101,736 acres are at present under control. As lands are acquired and units are consolidated, administration of the area for wild life refuge purposes is established.

The administration of this area as a refuge and breeding place for migratory birds included in the terms of the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916; and as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants to such extent as the Secretary of Agriculture may by regulations prescribe, is under the joint jurisdiction of the Departments of Agriculture and Commerce, Agriculture dealing with game animals, fur-bearing animals, birds and plant life and the Department of Commerce with fish and other aquatic animal life. In addition, the States of Minnesota, Wisconsin, Illinois and Iowa have adopted enabling legislation in connection with the establishment of the project, and 9,743 acres of state and city owned lands are located within the exterior boundaries of the refuge. The game departments of these states also assist in the enforcement of state laws and regulations as well as the Federal Law and Regulations in the refuge.

Posting, patrol, and administration of the refuge is proceeding as rapidly as the consolidation of administrative units economically permits. Warden service and fire patrol measures are maintained on land and water and development of wild life resources is being undertaken to the fullest extent possible under available funds.

## (k) BEAR RIVER MIGRATORY BIRD REFUGE

Explanation of change in language: The elimination of language pertaining to the appropriation of funds under the $350,000 authorization for the establishment of the refuge is recommended as the full amount of the authorization has now been appropriated. The language pertaining to the establishment has been retained with the addition of the wording "there is hereby appropriated" and "shall remain available until June 30, 1932" in order that any uncompleted work may be finished during the fiscal year 1932 within the limit of available funds. The other changes are to include a reference to a later act affecting the refuge and to eliminate unnecessary language.

| | |
|---|---|
| Appropriation, 1931..... | $94,000 |
| Unexpended balance carried forward from 1930..... | 37,000 |
| Total, 1931..... | 131,000 |
| Budget, 1932..... | 19,900 |
| Decrease..... | *111,100 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase or Decrease | |
|---|---|---|---|---|---|
| Development & Administration..... | $174,580 | - | - | - | |
| Administration | - | $19,000 | $19,900 | $ +900 | (1) |
| Development | - | 110,000 | - | -110,000 | (2) |
| Acquisition of Land | 25,254 | 2,000 | - | - 2,000 | (2) |
| Totals | 199,834 | 131,000 | 19,900 | 111,100 | |

The decrease of $111,100 in this appropriation involves an increase of $900 and a decrease of non-recurring items of $112,000, as follows:

(1) $900 for additional patrolmen during hunting and breeding season in connection with the administration of the Bear River Migratory Bird Refuge. During the fiscal year 1932 a large area of the Refuge will be under water and many miles of dikes will need to be cared for. In order to properly look after these dikes and keep them in good condition it will be necessary to employ additional patrolmen for temporary duty.

(2) $112,000 decrease is due to the completion with available funds of the acquisition of land and construction work necessary in connection with the establishment of the Bear River Migratory Bird Refuge.

Activities under appropriation for Bear River Migratory Bird Refuge.

The work of establishing a migratory bird refuge at the mouth of Bear River Bay, Great Salt Lake, Utah, has included the construction of a massive outer dike some 20 miles in length and 4 division dikes and feeder canals of a total length of 15 miles for the holding back and flooding with fresh water of some 35,000 acres of flat delta lands surrounding the mouth of Bear River. In addition, it has been necessary to erect river control structures for the diversion of water into the five units of the project. Feeder canals also lead into the several units. The massive outer dike also prevents the refuge area from being flooded by salt water from Great Salt Lake when the lake level is high.

The contracts have all been let for the completion of this work during the 1931 fiscal year. One of the units of approximately 7,000 acres has been completed and approximately 5,000 acres flooded.

It is necessary to supervise and patrol this area to safeguard the movements and protect the birds that frequent the area during migration, hunting and feeding seasons. For a great number of years mortality of waterfowl and other migratory game birds in the area has been particularly disastrous through alkaline poisoning and pending the completion of the improvements it is necessary to conduct extensive operations in rescuing sick birds and in warding the birds away from dangerous areas. Extensive patrol of the outer and division dikes is also necessary for their proper maintenance.

## (1) MIGRATORY BIRD CONSERVATION REFUGES

Explanation of change in language: The insertion of additional language at end of item is recommended for the purpose of making available in 1932 any amount unexpended from the appropriation for 1931 and also to provide for the incurring of obligations and the entering into contracts for the purchase or rental of areas to the extent of the authorized appropriations of $875,000 up to and including the fiscal year 1932.

| | |
|---|---|
| Appropriation, 1931..... | $200,000 |
| Budget, 1932..... | 400,000 |
| Increase..... | $200,000 |

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase | |
|---|---|---|---|---|---|
| Acquisition of Refuge Land | $49,296 | $180,000 | $375,000 | $195,000 | (1) |
| Investigation of Food Resources of Migratory Bird Refuge Areas..... | 20,543 | 15,000 | 15,000 | - | |
| Maintenance of Migratory Bird Conservation Refuges..... | 850 | 5,000 | 10,000 | 5,000 | (2) |
| Migratory Bird Conservation Commission..... | 226 | 5,000 | 5,000 | - | |
| Totals | $70,915 | $205,000 | $405,000 | $200,000 | |

The increase of $200,000 is submitted for the following purposes:

(1) $195,000 for the acquisition of lands for migratory bird refuges throughout the United States.

To fulfill the obligation assumed by the United States under the Migratory Bird Treaty with Great Britain, the Migratory Bird Conservation Act of February 18,1929 (U. S. C. Supl. III, Title 16, Secs. 715) covers a ten-year refuge acquisition program, and authorizes appropriations as follows for acquisition of land and for maintenance: 1930, $75,000; 1931, $200,000; 1932, $600,000; 1933, $1,000,000 and $1,000,000 annually thereafter for six consecutive years, up to and including 1939, after which $200,000 annually is authorized for maintenance. These refuges will be established throughout the United States and will embrace extensive areas of lowland comprising marsh, contiguous woodland and more or less extensive water areas, or places that were formerly well suited for migratory bird refuge purposes, the usefulness of which has been destroyed by reason of drainage developments or other causes, but which may be restored to their natural conditions.

The funds made available during the fiscal year 1930 and a portion of those made available during the fiscal year 1931 have

been used, as was planned, on the examination of numerous areas throughout the United States deemed suitable for the purposes contemplated under the Act.

Examinations and appraisals of additional areas will be conducted under this appropriation, but the purchase of refuge sites will be the major activity. The areas to be examined will probably amount to 500,000 acres. There are now available for acquisition approximately one million acres of land which are estimated to be worth an average of not less than five dollars per acre.

By August 1, 1931 contractual obligations can be negotiated that will absorb all of the funds made available for the fiscal year 1932, and by January 1, 1932 also the $200,000 authorized but not included in the 1932 appropriation.

Because of the nature of the work and the uncertain trend that negotiations for land purchases may take, it is not possible to now specifically state what tracts will be purchased in the fiscal year 1932, but there are enough suitable lands available for purchase so that the Department has a wide field of selection at advantageous prices.

Activities Under This Appropriation

When work was begun on July 1, 1929 under the Migratory Bird Conservation Act, information on the distribution and migration of waterfowl collected during the last forty-five years by the Biological Survey and the results of the waterfowl censuses supervised by this Bureau in 1927, 1928 and 1929 were available. Regarding many potential refuge sites there was also at hand information that had been gathered by specialists of the Survey who had previously visited a large number of these areas. From this mass of information a schedule was made by the Biological Survey of known concentration points of waterfowl, and plans were made by the Survey to examine them intensively.

Two lines of investigation of refuge sites were instituted. (1) Migratory bird food resources, existing and potential, were studied in 48 States, covering 189 units, with an aggregate area of about 3,700,000 acres. (2) Detailed examinations were made of the lands embraced within acceptable units to determine accurately the types of land, their vegetative cover, the uses made of land and cover, and the character, extent, and value of existing improvements. Ownership data also were compiled and valuation studies made. Up to this time these investigations have been conducted in 34 states, and statistical data and maps compiled on 76 units. The area of lands and waters so examined by the Biological Survey aggregate 1,739,609 acres.

From the studies made, certain definite accomplishments resulted in the designation as acceptable of seven refuge sites made up in whole or in part of Federal-owned lands in the public land

States of the West. Before the end of the fiscal year 1930 two of these had been created by Executive Order as migratory bird refuges, and two refuge units were considered and sale commitments submitted by the owners of lands within the proposed refuges were approved by the Migratory Bird Conservation Commission. The Benton Lake Bird Refuge, one of those established by Executive Order, is situated in Choteau and Cascade Counties, Montana, and will contain in its entirety 26,669 acres, of which 12,389 acres are public lands. The Executive Order of November 21, 1929, set aside these public lands and immediately thereafter it came under the jurisdiction of the Biological Survey for administration as an inviolate sanctuary.

The Salt Plains Wild Life Refuge is situated in Alfalfa County, Oklahoma. The total area designated as suitable for refuge purposes contains 19,985.05 acres. Of this 18,683.59 acres were found to be public lands. By Executive Order dated March 26, 1930 the public land acreage was withdrawn as a migratory bird refuge.

The Migratory Bird Conservation Commission has during the fiscal year 1931 approved the purchase of 5,180 acres in Colorado at a cost of $3.50 per acre and the acquisition of 32,555 acres in South Carolina. The latter is under contract of purchase at the rate of seventy-five cents per acre. Agreements of purchase have been proffered to the Department covering 13,981.27 acres in Florida at $2.50 per acre, and 8,982.12 acres in Southern California at $2.68 per acre. These lands, if approved by the Migratory Bird Conservation Commission, will be covered by funds from the current year's appropriation. Negotiations now being conducted will shortly result in acquisition commitments obligating all funds that remain available in the fiscal year 1931.

(2) <u>$5,000 for the administration and maintenance of new reservations.</u>

The increase is needed for the administration and maintenance of the refuges acquired under the Migratory Bird Conservation Act and those established by Executive Order since the inception of that work. Already four areas are under control and contractual obligations will be entered into before the end of the fiscal year 1931 for the purchase of other refuges.

All reservations acquired by purchase, gift or lease under this Act or those coming under the jurisdiction of the Department by Executive Order will promptly be placed under administration. The boundaries will be adequately posted and patrol service established. In addition any developments deemed necessary

to improve feeding or nesting conditions will be undertaken.

It is anticipated that at least a limited amount of cooperation will be available to the Department from State game officials and local conservation organizations in the administration, maintenance and development of these areas.

CHEYENNE BOTTOMS MIGRATORY BIRD REFUGE

Explanation of new language: Language has been added to cover this activity which was covered for 1931 in the second Deficiency Act, 1930.

| | |
|---|---|
| Appropriation, 1931,..... | $50,000* |
| Budget, 1932..... | 200,000 |
| Increase..... | $150,000 |

*Carried in Second Deficiency Act, 1930.

Project Statement

| Project | Expended 1930 | Estimated 1931 | Estimated 1932 | Increase |
|---|---|---|---|---|
| Cheyenne Bottoms Migratory Bird Refuge..... | - | $50,000 | $200,000 | $150,000 |

The increase of $150,000 is submitted for the acquisition of land for the establishment of the Cheyenne Bottoms Migratory Bird Refuge.

The increase of $150,000 is submitted for the acquisition of land for the extablishment of the Cheyenne Bottoms Migratory Bird Refuge which is authorized by Act of Congress approved June 12, 1930.(Public 346-71st Congress). By this measure the Secretary of Agriculture is authorized to acquire 20,000 acres of land for a migratory bird refuge in Cheyenne Bottoms, Kansas. For that purpose an appropriation of $250,000 was authorized of which $50,000 was made available for the fiscal year 1931, through the Second Deficiency Act, 1930. This area forms one of the very important links in the nation-wide network of refuges to be established under the Migratory Bird Conservation Act. By reason of the threat to drain the Cheyenne Bottoms at this time and because of the limited appropriations under the Migratory Bird Conservation Act, this refuge was made the subject of a special Act so that proceedings could be started at once looking to the acquisition of it.

## Activities Under This Appropriation

Immediately after the $50,000 was made available by the Deficiency Act, 1930, the Department instituted active studies in order to determine all factors having a bearing on land values within the refuge and data is being assembled that will be indispensable in arriving at equitable prices to be paid for the lands. In addition, detailed engineering studies are being conducted to demarcate the desirable exterior limits of the refuge, to locate property lines, and to secure data bearing on the topographic details of the land involved. Title examinations are also being conducted incident to the conveyance of the lands to the United States by the owners of the properties needed.

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(Continued in Volume 3, Page 282)